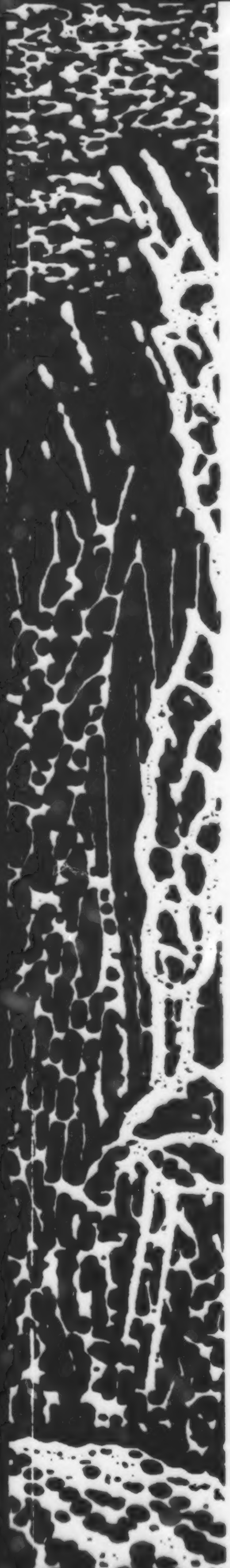

GUIDE TO
CROP PROTECTION
2000

- WEEDS
- PLANT DISEASES
- INSECTS

Saskatchewan
Agriculture
and Food

THIS PUBLICATION IS ONLY A GUIDE. ALWAYS REFER TO THE PRODUCT LABEL FOR APPLICATION DETAILS AND PRECAUTIONS.

Introduction

Weed Control

Plant Disease Control

Insect Control

Resource Personnel

Saskatchewan Agriculture and Food

Enquiries	(306) 787-5140
Provincial Weed Control Specialist	(306) 787-4673
Provincial Insect Control Specialist	(306) 787-4669
Provincial Plant Disease Control Specialist	(306) 787-4671
Crop Protection Laboratory (plant disease diagnosis, weed and insect identification, herbicide resistance screening)	(306) 787-8130

Soils & Crops Agrologists

Saskatoon	(306) 933-5285
North Battleford	(306) 446-7475
Swift Current	(306) 778-8291
Tisdale	(306) 878-8807
Yorkton	(306) 786-1508
Indian Head	(306) 695-4249

Extension Agrologists

District #	*Location*	*Phone*
1	Estevan	637-4606
2	Assiniboia	642-7225
4	Shaunavon	297-5450
5	Moosomin	435-4525
6	Indian Head	695-4250
7	Weyburn	848-2374
8	Moose Jaw	694-3615
9	Swift Current	778-8284
10	Maple Creek	662-5444
12	Yorkton	786-1500
14	Regina	787-2344
15	Davidson	567-2806
16	Outlook	867-5555
17	Kindersley	463-5441
19	Canora	563-5604
20	Wynyard	554-5444
21	Humboldt	862-6700
22	Saskatoon	933-5090
23	Biggar	948-3577
25	Hudson Bay	865-4430
26	Tisdale	878-8806
30	Unity	228-6400
31	Nipawin	862-1787
32	Prince Albert	953-2770
34	North Battleford	446-7467
35	Lloydminster	825-6470
36	Meadow Lake	236-7600
40	Rosetown	882-5454
41	Carnduff	482-3432
42	Kelvington	327-4718
43	Watrous	946-3230

Agriculture and Agri-Food Canada

Saskatoon Research Centre	(306) 956-7299
Scott Research Farm	(306) 247-2011
Melfort Research Farm	(306) 752-2776

University of Saskatchewan

Plant Sciences (formerly Crop Science & Plant Ecology)	(306) 966-5006

Irrigation Crops

Saskatchewan Water Corp.	(306) 867-9331

Shelterbelts

PFRA Shelterbelt Centre Indian Head	(306) 695-2284

Pesticide Analysis (herbicide, fungicide or insecticide)

Enviro-Test Labs	1-800-668-9878

Additional Information

For more information on herbicides, pesticides, weed control, insect control, plant disease control and pesticide safety, consult the publications available from your Extension Agrologist at your district Rural Service Centre or visit the Saskatchewan Agriculture and Food Internet site: http://www.agr.gov.sk.ca.

Major Poison Control Centres in Saskatchewan

Saskatoon	Regina
University Hospital	Regina General Hospital
(306) 655-1010	(306) 766-4545

Toxicology Centre

University of Saskatchewan
(306) 966-7441

Spill Report

Saskatchewan Environment
1-800-667-7525

100-03549/

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Table 1: Approximate Conversion Factors*

Metric Unit	*Metric to Imperial Multiply By*	*Imperial Unit*	*Imperial to Metric Multiply By*	*Metric Unit*
LINEAR				**LINEAR**
centimetre (cm)	x 0.39	inch	x 2.54	centimetre (cm)
AREA				**AREA**
square metre (m^2)	x 1.2	square yard	x 0.84	square metre (m^2)
hectare (ha)	x 2.5	acres	x 0.4	hectare (ha)
VOLUME				**VOLUME**
litre (L)	x 0.22	gallon	x 4.55	litre
PRESSURE				**PRESSURE**
kilopascals (kPa)	x 0.14	psi	x 6.9	kilopascals (kPa)
WEIGHT				**WEIGHT**
gram (g)	x 0.04	oz	x 28.35	gram (g)
kilogram (kg)	x 2.2	lb	x 0.454	kilogram (kg)
AGRICULTURAL				**AGRICULTURAL**
litres per hectare (L/ha)	x 0.089	gallons/acre	x 11.23	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.357	quarts/acre	x 2.81	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.71	pints per acre	x 1.41	litres per hectare (L/ha)
millilitres per hectare (mL/ha)	x 0.014	fl.oz per acre	x 70.22	millilitres per hectare (mL/ha)
kilograms per hectare (kg/ha)	x 0.89	lb per acre	x 1.12	kilograms per hectare (kg/ha)
grams per hectare (g/ha)	x 0.014	oz/acre	x 70	grams per hectare (g/ha)

*EXAMPLE: To convert centimetres to inches, multiply by 0.39; conversely, to convert inches to centimetres, multiply by 2.54. CAUTION: Herbicide labels are in metric units only. Conversion between the Metric and Imperial system may result in confusion. It is recommended to use metric units only.

2000 Guide to Crop Protection

For Reference Until December 31, 2000

This publication is updated annually and replaces the 1999 and previous issues.

Introduction

How to Use This Book

This publication is only a guide. Always refer to the product label for application details and precautions.

The *Guide to Crop Protection* is divided into 3 sections: (1) Weed Control; (2) Plant Disease Control; and (3) Insect Control.

To use the information in each of these sections, use the following process:

1. Turn to the charts at the beginning of each section. There is a set of charts for weeds, plant diseases and insect control. Select the chart for the crop you want or plan to grow. Use the chart to match your weed, disease or insect problems with the products available for that crop.
2. Once you have narrowed your product choices down to a few candidates, go to the recommendation section for that product. Products are listed alphabetically. Read the recommendations thoroughly for each product you are considering.
3. Read the product label attached to the container for detailed instructions on application.

This publication is intended to be used as a guide only. Information contained herein is that available at time of printing. While every effort has been made to ensure accuracy, the provincial government does not accept responsibility for label changes. When more than one trade name is listed, not all weeds or tank mixes may appear on all labels. Consult product labels attached to pesticide containers for final detailed instructions.

Certain recommendations in this publication are given in quantity of commercial product per acre (L or kg/acre). Product labels are given in quantity of product per hectare (L or kg/ha). To avoid application errors be sure to read and understand label recommendations.

The *Guide to Crop Protection* includes the most recent recommendations for weed, plant disease and insect control in field and forage crops. These recommendations are based on the uses registered under the Pest Management Regulatory Agency's *Pest Control Products Act*. It is an offence under *The Pest Control Products Act* to apply any chemical in a manner not consistent with the product label. If you have any doubts regarding the instructions in this publication, or on the product label, contact the company representative, your local agricultural office or the Pest Management Regulatory Agency for further advice.

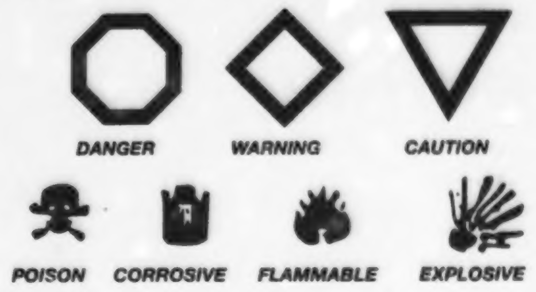
Safe Use of Herbicides, Fungicides and Insecticides

Herbicides, fungicides and insecticides are classified according to the use hazard and risk involved. The categories of hazard are:

- toxicity
- flammability
- explosive potential
- corrosivity

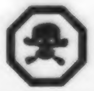
The degree of risk is represented by symbols taken from common traffic sign shapes represented by the stop, caution and yield signs. The signal word for each of the signs is danger (high risk), warning (moderate risk) and caution (low risk). Where the risk is minimal, no designation is required. The label on the container will carry the appropriate signs for the protection of the user. Degree of risk symbols for herbicides, insecticides and fungicides used in field and forage crops are included in the product directory. The symbols are illustrated in Figure 1.

Figure 1. Degree of Risk and Hazard Symbols

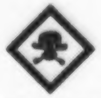


LD_{50} values are used to rate the toxicity of pesticides. The LD_{50} refers to the dose of pesticide (in mg per kg of the test animal's body weight) that is lethal to 50 percent of the group of test animals. For example, if a pesticide has an LD_{50} value of 10 mg/kg, and the test animals each weigh 1 kg, then 50 percent of the animals would die if they each ate 10 mg of the pesticide.

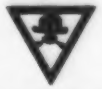
Table 2. Oral LD_{50} Values as they relate to the Risk/Hazard Symbols



DANGER POISON
LD_{50} less than 500 mg/kg
indicates high toxicity



WARNING POISON
LD_{50} 500-1,000 mg/kg
indicates moderate toxicity



CAUTION POISON
LD_{50} 1,000-2,500 mg/kg
indicates low toxicity

SYMBOL ABSENT
LD_{50} greater than 2,500 mg/kg
indicates very low toxicity

Different types of protective equipment are required for pesticides that differ in toxicity. Special equipment requirements are described on the product label, but in general the following precautions must be taken when using pesticides of different hazard ratings.

Danger Poison - requires goggles, respirator, gloves and skin protection, avoid fumes and spray mist.

Warning Poison - requires goggles, gloves and skin protection, avoid fumes and spray mist.

Caution Poison - requires gloves and skin protection, avoid fumes and spray mist.

The absence of a hazard symbol on a pesticide label indicates low toxicity to mammals. Nevertheless, protective clothing should be worn when using pesticides that do not have a hazard symbol.

Protecting Yourself from Exposure to Herbicides, Fungicides and Insecticides

The use of protective equipment and sound safety procedures will help minimize your exposure to herbicides, fungicides and insecticides. Follow the 10 rules for safe application listed below, and wear the safety equipment recommended.

10 Rules for Safe Application

1. Never smoke or eat while applying pesticides.
2. Avoid inhaling sprays or dusts. Wear protective clothing and a respirator.
3. Sprayer lines carrying chemicals should not enter the operator's cab.
4. Have soap, water and a towel available. Should concentrated product spill on skin, hands, face or eyes, wash immediately.
5. Wash hands and face when leaving the treated area, before break periods, lunch or urination.
6. Bathe or shower and change into clean clothing after working with pesticides. Wash clothing each day before re-use.
7. Call a physician or get the patient to a hospital immediately if symptoms of illness occur during or shortly after pesticide application. Be sure to take along the product label or container.
8. Store pesticides out of reach of children and where there is no chance of contact with human food or livestock feeds. Do not store herbicides with insecticides and avoid cross-contamination. Storage areas should be locked.
9. Keep chemicals in their original containers, never in unmarked containers or bottles used for food or drink.
10. Follow proper container disposal methods. All containers should be triple rinsed or pressure rinsed, punctured to render the container non-reusable, and delivered to designated disposal sites.

Protective Clothing

Wear protective equipment as described in the chart to reduce exposure.

EQUIPMENT	PROTECTION	HOW TO WEAR IT
Coveralls	There are two types of coveralls: disposable and reusable. Disposable coveralls are lightweight and comfortable on warm days. They can be worn for mixing and applying pesticides, then discarded at the day's end. If they become contaminated, they should be discarded at once. The second type of coverall is made of washable fabric and may be reused many times. These fabric coveralls are adequate for use with all but the most highly toxic and concentrated pesticides.	Button (or zip) right up to the neck. Loose coveralls around the neck will suck and blow pesticide in and out of the interior of the coveralls as you bend and move. Wear coveralls over a long-sleeved shirt and pants.
Aprons	When pouring or otherwise handling concentrated pesticides, it makes good sense to wear protection in the form of an apron. The apron protects the front of your body from spills or splashes of the concentrate. The apron should be made of rubber or synthetic liquid-proof material that will resist the solvents used in formulating the pesticide.	Make sure the apron covers your body from your chest to your boots.
Gloves	Protect your hands by wearing chemical-resistant gloves. Neoprene gloves provide the best protection. Natural rubber gloves may be used when handling organo-phosphorus or carbamate pesticides. Be sure that they are designed for use with solvents and pesticides. Never use lined gloves, gloves with wristbands or leather gloves.	Put gloves on and roll up the first inch or two of the cuff. That way when you lift your hands, any liquid on the gloves won't drip down your arms.
Hats	Use a chemical-resistant hat, preferably made of washable plastic. The hat may be a hard hat or made of flexible plastic. In either case, it should have a plastic sweatband. Wash and dry entire hat after each use and before storing. Ordinary baseball caps with cloth sweatbands are dangerous as they absorb the pesticide and recontaminate the forehead each time you wear them. Even small amounts of moderately or slightly toxic pesticides may cause severe skin irritation or other illness if exposure continues for several days.	
Boots	Wear chemical-resistant, unlined boots. These boots are available in a variety of styles and materials. Neoprene boots are the best. Knee-length boots offer greater protection because they extend above the lower end of the apron. Avoid leather or fabric boots and shoes because these will absorb pesticides and cannot be cleaned effectively.	Wear your pant legs outside the top of your boots. This will prevent spills and splashes from running into the boot and onto your leg.

Protecting Your Eyes, Face and Lungs

Wear the following equipment to protect your facial area from exposure:

EQUIPMENT	PROTECTION	HOW TO WEAR IT
Goggles	Chemical-resistant goggles keep your eyes safe from both splashing and, if using dry formulations, dusts or granules. Don't use goggles with cloth or elastic headbands as these will absorb pesticides.	Wear goggles snugly on your face so that the sides of your head are protected from splashes. If you wear glasses, make sure you purchase goggles that fit snugly over them. Never wear contact lenses when working around pesticides.
Respirators	Only NIOSH-approved respirators should be used. Do not exchange parts of different respirators. (For example, do not use a cartridge produced by Company "A" with a respirator produced by Company "B" as the combination may not provide adequate protection to the user). Dust masks are ineffective in protecting against herbicide vapours. Similarly, the filters on tractor cabs are intended to remove dust and are not designed to protect against herbicide vapours or mists. Chemical cartridge respirators are recommended for outdoor use when mixing and applying herbicides.	When carrying out operations, change filters each day. The cartridge should be replaced when chemical odour becomes apparent or when breathing becomes difficult. New cartridges should always be installed at the beginning of the spray season. Prior to commencing work, check the face seal while the respirator is on the wearer's face. Regardless of design, respirators cannot be worn securely by people wearing beards, moustaches or sideburns.
Face Shields	Goggles offer some protection, but frequently full-face protection is advised or required according to the pesticide label. It is especially important to protect your eyes and face when pouring or mixing liquid concentrates. Effective face shields are made of clear plastic.	Since the shield attaches to the hard hat, you can raise or lower it as needed.

Avoiding Spray Drift:

To minimize the risk of drift, follow these guidelines:

1. Do not spray in winds above 15 km/h (9 mph).
2. Do not spray under dead calm conditions in early morning, night, or late evening. These are often associated with temperature inversions and the combination of these factors can result in long-distance spray drift (2 km or more). Fog or dust that seems to hang in the air is a good indicator of an inversion.
3. Avoid nozzle pressures above 45 psi (310 kPa) for conventional flat fan tips.
4. Use a minimum of 10 gal/acre (45 L/acre) water for all pesticides unless otherwise specified for the product.
5. Take note of buffer zones identified in the "Restrictions" section of this guide. Do not spray when the wind is blowing towards a nearby sensitive crop, shelterbelt, garden, or water body.
6. Use amine formulations of 2,4-D or MCPA where possible. Use special care when applying volatile herbicides (most products in Group 3 and Group 4, particularly ester formulations). Avoid spraying these products on or immediately before hot days.
7. Ensure that air flow from air assisted sprayers is properly set to minimize airblast rebound and drift for different crop canopies.
8. Operate nozzles at their minimum recommended height. For 80° tips, this is 18" (45 cm), and for 110° tips, this is 12 " (35 cm). Orienting nozzles forward allows further height reductions.
9. Special nozzles are now available that create coarse, low-drift sprays. Pre-orifice, Turbo-TeeJet, or venturi-type nozzles are available from a number of manufacturers, and these reduce drift by 50 to 95 percent. (Refer to the section entitled **Herbicide Efficacy with Low-Drift Nozzles**)
10. Consider equipping your sprayer with protective shrouds. A number of different designs are available that can reduce drift between 35 and 75 percent.

For more information on reducing drift refer the Factsheet entitled "Spray Drift – Causes and Solutions" available from your local extension office or at the SAF Website: www.agr.gov.sk.ca.

Herbicide Efficacy with Low-Drift Nozzles

A number of low-drift nozzles are now available from different suppliers. Well established nozzles, such as the Turbo TeeJet, reduce drift by about 50 percent and provide equivalent efficacy to a standard flat fan nozzle. Newer nozzles ("venturi" types) are best known for their dramatic ability to reduce drift (50 to 95 percent), but information on pesticide efficacy is still scarce. Initial data suggest that these nozzles perform well at conventional carrier volumes, travel speeds, and product rates. Some aspects require special attention:

Pressure: Most venturi-type nozzles require higher pressures to operate properly. Below 40 psi (275 kPa), patterns may deteriorate rapidly resulting in poor overlaps and erratic control. Higher pressures are recommended (60 to 80 psi, or 415 to 550 kPa). Drift potential remains low, even at these high pressures. When using automatic rate controllers, make sure your pressures remain high enough for good nozzle performance.

Water Volume: Droplet size become more important at lower water volumes. Little is known about low-drift nozzle performance at or below 5 gal/acre (23 L/acre). Since low-drift nozzles generate fewer droplets than conventional nozzles, ensure that water volumes are high enough for coverage when using coarse sprays.

Weed Type: Difficult-to-wet weeds, such as wild oats, green foxtail, lamb's-quarters, and cleavers, typically require finer sprays for effective coverage. When using venturi nozzles on these weeds, make sure your pressure is high enough to achieve good coverage. Larger weeds and reduced product rates typically make chemical control more difficult, and these conditions may also reveal some performance differences between nozzles.

Herbicide Type: According to preliminary results, herbicides that belong to herbicide Groups 2, 4, and 9 perform well with venturi nozzles, even at normal pressures (40 psi). Application of herbicides in Groups 1, 6, 8, and 10 may require higher pressures with venturi nozzles to maintain good performance, especially under challenging conditions. Wild oat control may be reduced with the coarsest sprays, even when applied at high pressure.

Check with your chemical representative to see if the manufacturer supports the use of low-drift nozzles with their products.

More information is available in the factsheet "Making Sense of New Nozzle Choices," available from your local extension office or at the SAF Website: www.agr.gov.sk.ca.

Handling a Drift Complaint

When spray drift occurs, it is important to take the right steps to resolve the complaint. If you suspect that your crop or property has been damaged because of spray drift, use the following guidelines for resolving the situation.

1. Are you sure that the symptoms or damage you see has been caused by spray drift? Contact your local agricultural office to help determine if the damage is the result of spray drift.
2. Contact the suspected applicator as soon as possible. View the damage with the suspected applicator and determine if that person did, in fact, cause the damage.
3. If the damage was caused by the applicator, determine the extent of the damage and the level of compensation (if any) with the applicator.
4. If the situation cannot be resolved quickly because of disagreements on the extent of damage or level of compensation, contact your local agricultural office to discuss options on how to proceed. Documentation will be required, particularly if insurance companies are involved.
5. The involvement of a private consultant is recommended if documentation is required. Required documentation often includes samples of the damaged plants, photographs, and yield comparisons to determine losses. Your agricultural office can provide you with a list of private consultants in your area.
6. The best approach is to start an open and honest line of communication with the suspected applicator. The majority of drift complaints are resolved quickly and efficiently by communicating with the applicator, without the involvement of outside parties.

Container Disposal

Rinse all containers prior to disposal to reduce environmental contamination caused by open dumping of unwanted containers.

Triple Rinsing

Triple rinsing renders used pesticide containers (metal, plastic, glass) more than 99.9 percent free of residues, in most cases.

Here are the steps that should be followed:

1. Empty contents of the container into the spray tank and drain in a vertical position for 30 seconds.
2. Add a measured amount of rinse water or other diluent until container is about one-fifth full.
3. Rinse the container thoroughly and pour the rinsate into the spray tank.
4. Repeat the procedure twice (it should take only about 5 minutes in total).
5. Puncture or break triple rinsed containers to render them non-reusable. Paper bags should be rinsed once prior to disposal.

Pressure Rinsing

Also available are pressure rinsers that can rinse all sizes of empty pesticide containers that can be lifted into position over the spray tank.

A 30-second rinse with a pressure rinser is convenient and just as effective as triple rinsing.

Pressure rinsers are constructed to be thrust into the bottom of a metal can or plastic jug. Holes, situated laterally in the rinser tip, direct water from a pressurized source against the inner sides of the container and effectively wash the residual pesticide into the spray tank.

Some farmers have found it convenient to attach a rinser to the pump on their large water storage tank to minimize container handling.

Pressure rinsers have the added advantage of rendering containers useless by automatically puncturing them.

Disposal of Containers

Properly rinsed containers should be delivered to a designated pesticide container disposal site. Contact your ag rep, municipal office or weed supervisor for the locations of pesticide container disposal sites in your municipality.

How to Identify Crop and Weed Leaf Stages

Recognition of plant growth stages is essential for effective weed and disease control. Many herbicides and fungicides are safe on a crop only when applied at a specific growth stage. Similarly, weeds are controlled only when they are at certain growth stages.

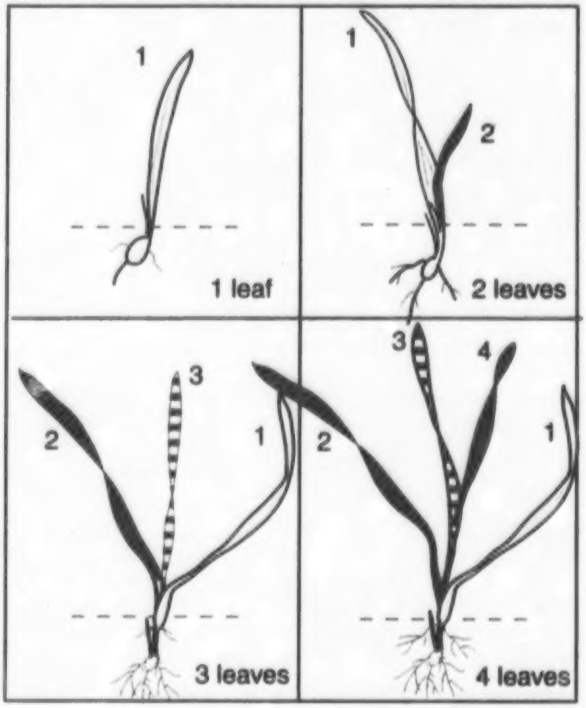
For most post-emergent products, growth stages are described by the number of leaves. The following is a description of how to count leaves for staging.

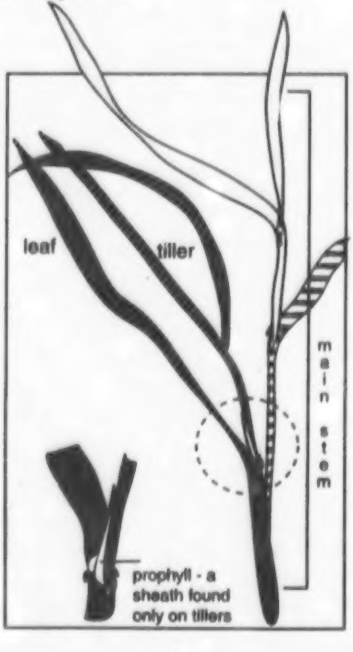
Cereals and Annual Grass Weeds

Manufacturers generally use two different systems of staging for grasses. The minimum stages of application are similar, while the later stages may differ.

Some manufacturers use "Total Leaf Count" stages based on the number of leaves on the entire plant, including tillers or secondary shoots. Most recommendations however, are based on the number of main stem leaves and tillers. Tillers or stools are the secondary shoots or stems of a grass plant. Similar to the branches of a broadleaf plant, tillers will emerge from the axils between the leaf and main shoot. Tillers usually begin to appear at the 3 or 4 leaf stage. When staging a plant in this manner, be sure to identify the tillers first, then count only leaves that originate from the main shoot.

Figure 2. Leaf Stages of Cereals and Annual Grass Weeds





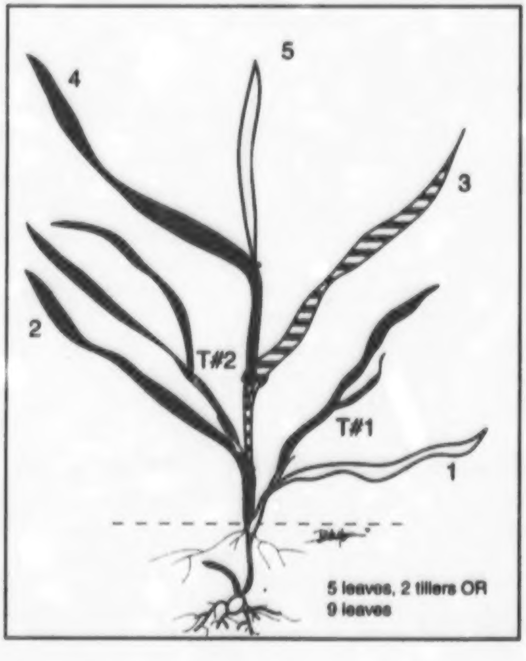
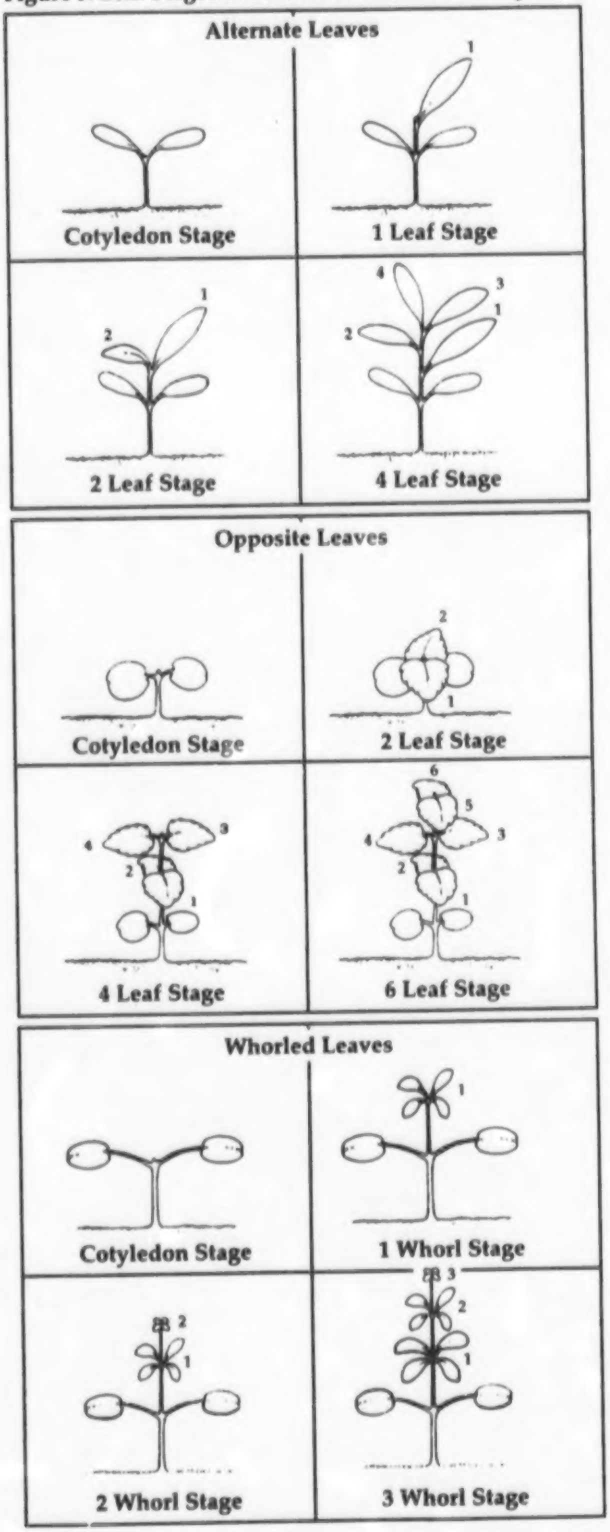


Figure 3. Leaf Stages of Broadleaf Weeds and Crops


Alternate Leaves
1
Cotyledon Stage
1 Leaf Stage
1
2
4
3
1
2
2 Leaf Stage
4 Leaf Stage
Opposite Leaves
2
1
Cotyledon Stage
2 Leaf Stage
6
5
4
3
2
1
4
3
2
1
4 Leaf Stage
6 Leaf Stage
Whorled Leaves
1
Cotyledon Stage
1 Whorl Stage
3
2
1
2
1
2 Whorl Stage
3 Whorl Stage

Broadleaf Weeds

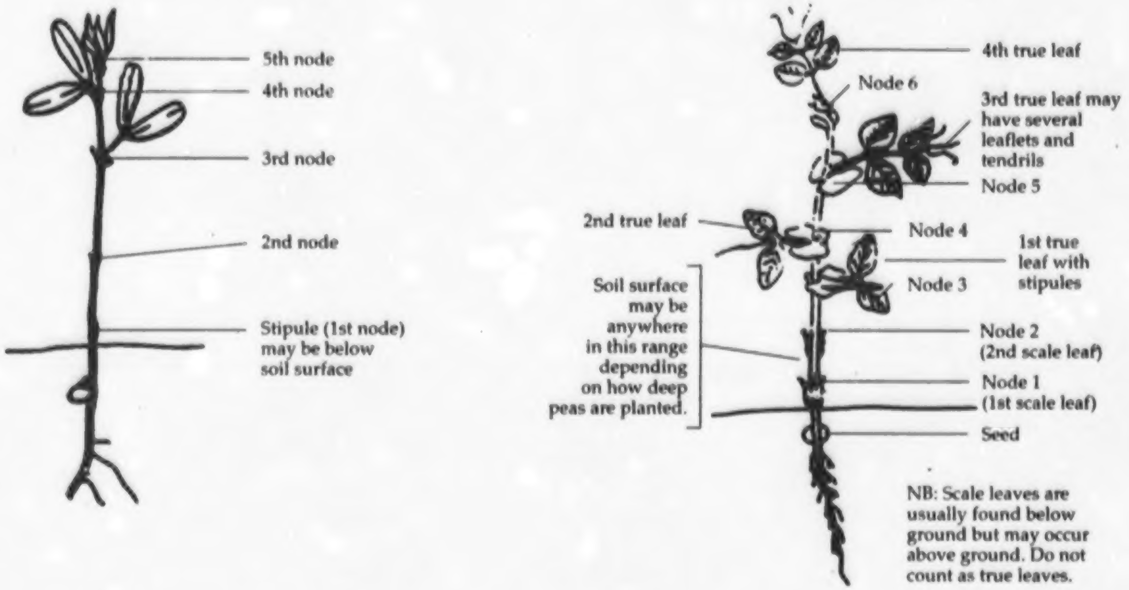
Cotyledons - These are the seed leaves that usually emerge above ground. On some plants, such as fababeans, lentils and peas, they stay below the soil surface. Cotyledons are not true leaves and are not counted when determining leaf number. They are a different shape than the true leaves and may dry up and disappear at an early stage.

Alternate leaves - Some plants have one leaf at each node on the stem. The next leaf emerges at the next higher node and extends away from the stem in the opposite direction. These plants (lamb's quarters and wild mustard are good examples) are said to have alternate leaves. To determine the leaf stage, simply count the number of leaves present (Figure 3).

Opposite leaves - Plants with two leaves at each node, one on each side of the stem, are said to have opposite leaves. The next pair of leaves on the next node are rotated about 45° so that they are not directly over the previous pair. Plants with opposite leaves have even-leaf numbers only. When counting, the leaf number progresses from cotyledons to 2 leaf, 4 leaf, etc. These plants generally appear shorter than plants with alternate leaves at a similar leaf stage. **Be sure to count each pair as two leaves**. Hemp nettle is a weed that has opposite leaves (Figure 3).

Whorled leaves - More complex plants like cleavers may have whorled leaves. These plants have three or more leaves at each node on the stem. The leaf number in each whorl may vary, so be sure to count each individual leaf unless the Guide or label recommendation refers to the number of leaf whorls (Figure 3).

Figure 4. Leaf Stages of Certain Special Crops and Forages



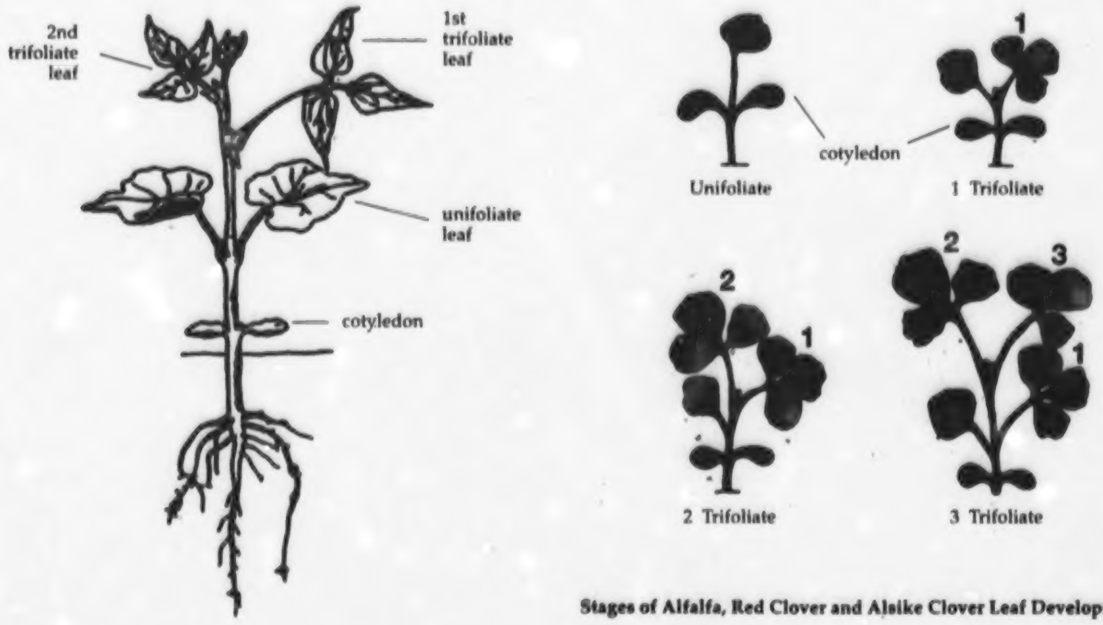
Lentil Seedling

5th node
4th node
3rd node
2nd node
Stipule (1st node) may be below soil surface

Field Pea Seedling

4th true leaf
Node 6
3rd true leaf may have several leaflets and tendrils
Node 5
2nd true leaf
Node 4
1st true leaf with stipules
Node 3
Soil surface may be anywhere in this range depending on how deep peas are planted.
Node 2 (2nd scale leaf)
Node 1 (1st scale leaf)
Seed

NB: Scale leaves are usually found below ground but may occur above ground. Do not count as true leaves.



Dry Bean Seedling

2nd trifoliate leaf
1st trifoliate leaf
unifoliate leaf
cotyledon

Forage Legume Seedling

cotyledon
Unifoliate
1
1 Trifoliate
2
1
2 Trifoliate
2
3
1
3 Trifoliate

Stages of Alfalfa, Red Clover and Alsike Clover Leaf Development

Weed Control

Resistance of Weeds to Herbicides

In recent years, the number of herbicide-resistant weeds and the areas they infest have increased.

Most herbicide-resistant weed infestations have developed following repeated use of the same herbicide (or herbicide group) for a number of years on the same field. Growers who have developed weed resistance on their farms will typically see a weed, which is normally controlled by a herbicide, escape uncontrolled after a number of years of use of the same product or product group. Individual plants may be resistant to 1.5 up to 10 or more times the normal field rate.

How to Identify Weed Resistance

It is important to avoid confusing herbicide failure caused by resistance with herbicide failure caused by various other factors (such as weather or application errors). When a herbicide fails to control weeds because of weather or application factors, that herbicide may work in the field the next season. But when herbicides fail because of the development of resistance, they will fail in subsequent years, regardless of weather or application procedures.

Herbicide resistance should be suspected under the following conditions:

- A weed species that the herbicide controlled in previous seasons now escapes the treatment, while other weeds that appear on the label continue to be controlled in the field.
- The escapes cannot be attributed to adverse weather or emergence after application (if a post-emergence product is in question).
- Irregular-shaped patches of a weed develop where the herbicide gives little or no control.
- Records of the past history of the field show repeated use of the same herbicide, or combinations of herbicides, that kill the weed in question in the same way.

Table 1: Herbicide-Resistant Weeds in Manitoba and Saskatchewan

WEED	DESCRIPTION OF RESISTANCE
Wild oats	Resistant to Group 1 herbicides (see Table 2, p. 16).
Wild oats	Resistant to Group 2 herbicides (see Table 2, p. 16)
Wild oats	Resistant to Group 8 herbicides (see Table 2, p. 16).
Wild oats	Resistant to Group 1, 2 and 8 (see Table 2, p.p. 16-17). At present, confirmed in Manitoba.
Green foxtail	Resistant to Group 3 herbicides (see Table 2, p. 16).
Green foxtail	Resistant to Group 1 herbicides (see Table 2, p. 16).
Green foxtail	Resistant to herbicides in both Groups 1 and 3 (see Table 2, p. 16).
Wild mustard	Resistant to Group 4 herbicides (see Table 2, p. 16). At present, confirmed in Manitoba.
Wild mustard	Resistant to Group 5 herbicides (see Table 2, p. 16). At present, confirmed in Manitoba .
Kochia, wild mustard, chickweed, hemp-nettle, Russian thistle	Resistant to Group 2 herbicides (see Table 2, p. 16). Wild mustard, chickweed and hemp-nettle confirmed in Manitoba. Russian thistle confirmed in Saskatchewan.

Avoiding Weed Resistance

It is far easier to avoid development of resistant weed strains than it is to eradicate or control them after they develop and infest an area.

To avoid the development of resistance on your farm, take the following steps:

1. Rotate herbicide usage so that the same herbicide is not used year after year. Rather than using the same product on an annual basis, consider using other products on a regular basis.
2. Be aware that when resistance to one product develops in a weed population, it can often mean the weed population has developed resistance to other herbicides that act in a similar manner.

   For example, green foxtail, which is resistant to Trifluralin, may be resistant to Edge as well; kochia, which is resistant to Ally, may be resistant to Refine Extra; wild oat populations resistant to Hoe-Grass 284 may be resistant to Achieve, Assure/Assure II, Poast Ultra, Puma or Select.

   This means that your long-term herbicide planning should ensure against using products from within the same group of herbicides year after year.
3. Keep accurate records of crop rotation and herbicide use. It will be easier to plan your long-term weed manage-

ment strategies if you have good records of your past management practices.

4. Limit the use of herbicides that remain active in the soil for extended periods of time. Examples are Ally and Amber. This is particularly important if these products have been used within the past 4 years.

Table 2: Herbicide Groups Based on Mode of Action

Group 1 (contain ACCase grasskillers) Achieve, Assure II, Champion Extra*, Champion Plus*, FlaxMax Ultra*, Freedom Gold*, Fusion, Fusilade II, Harmony Total*,Hoe-Grass 284, Hoe-Grass II*, Horizon, Muster Gold*, Poast Ultra, Prevail*, Laser DF*, Select, Triumph Plus*, Platinum*, Puma OnePass, Puma Super, Venture
Group 2 (contain ALS/AHAS inhibitors) Accent*, Ally, Amber, Anthem*, Assert, Champion Extra*, Champion Plus*, Escort, Express Pack*, Freedom Gold*, Harmony Total*, Laser DF, Muster, Muster Gold*, Odyssey, Pinnacle, Prism, Pursuit, Refine Extra, Sundance, Triumph Plus*, Unity*
Group 3 (contain mitotic inhibitors) Advance, Bonanza, Edge, Fortress*, Heritage, Rival, Treflan
Group 4 (contain growth regulator herbicides) 2,4-D, MCPA, Accent*, Accord, Anthem*, Attain, Banvel II, Breaker*, Buctril M*, Champion Plus*, Clovitox Plus, Estaprop, Compitox, Curtail M, DyVel, DyVel DS, Embutox, Express Pack*, FlaxMax Ultra*, Laser DF*, Lontrel, Mecoprop, Pea Pack*, Prestige, Prevail*, Rustler*, Target, Thumper*, Tropotox Plus, Triumph Plus*
Group 5 (contain photosynthetic inhibitors – triazines) Atrazine, Bladex, Breaker*, Laddock*, Lexone, Pea Pack*, Primextra Light*, Princep Nine-T, Sencor, Simazine, Velpar
Group 6 (contain photosynthetic inhibitors – nitriles/benzothiadiazoles) Basagran, Buctril M*, Hoe-Grass II*, Laddock*, Pardner, Platinum*, Puma OnePass*, Thumper*, Unity*
Group 7 (contain photosynthetic inhibitors – ureas/amides) Afolan F, Linuron, Lorox, Stampede EDF
Group 8 (unknown mode of action) Avadex BW, Avenge, Eptam 8E, Eradicane 8E, Fortress*
Group 9 (contain inhibitors of EPSP synthase) Credit, Glyfos, Renegade, Roundup Dry, Roundup Fast Forward*, Roundup Original, Roundup Renew, Roundup Transorb, Rustler*, Touchdown, Vantage, Vantage Plus, Victor
Group 10 (contain inhibitors of glutamine synthetase) Liberty, Roundup Fast Forward*
Group 11 (inhibit carotenoid synthesis - triazoles) Amitrol 240
Group 15 (inhibit cell division - benzamides, chloroacetamides) Dual II, Frontier, Kerb, Primextra Light*
Group 22 (membrane rupture, photosynthetic inhibitors) Gramoxone, Gramoxone PDQ, Reglone

*Some products contain more than one active ingredient and therefore may appear in more than one group. In some instances, both active ingredients act to kill the same weed using different modes of action. In these instances, use of tank mixes may slow down the process of developing weed resistance.

New herbicides do not necessarily have a unique mode of action and may fall within the groups listed in the charts.

Herbicides that have the same mode of action may not control the same weed spectrum or have the same crop safety. For example, Assert and Ally have the same mode of action; however, Assert controls wild oats while Ally does not.

If Weed Resistance Develops on Your Farm

It is important to identify weed resistance before it spreads across your farm. Plan on conducting a "patch watch" scouting program this summer to identify suspicious patches before they become difficult to manage. Resistant weed patches have been identified on fields where producers were unaware of their existence.

Your patch watch program should begin shortly after spraying and continue through July after the crop has headed out and most weeds are visible from a distance. If you find suspicious looking patches, contact your local agricultural office or crop protection company representative to assist you in confirming weed resistance. If resistance is suspected:

1. Map the location of the patches and mark them with stakes so you will remember their location.
2. Mow, cultivate or spot spray the patches. Resistant patches should not be allowed to produce seed.
3. Patchy areas should NOT be harvested with the rest of the field. Harvest these areas separately, and make sure to clean all harvesting equipment before leaving the area to prevent the spread of seeds across the field or to a neighbouring field.
4. Check patches each year to monitor their spread. Keeping your resistant weeds isolated to a manageable patch is easier than dealing with an entire field of resistant weeds.

Integrated Weed Management

A recent survey of wild oats in Manitoba showed that a number of patches were resistant to herbicides that they had never been treated with before. This survey has highlighted that fact that rotating herbicides is only a first aid measure to delay herbicide resistance. Long term management involves integrated approaches to weed control.

Practising integrated weed management means enhancing your chemical weed control program with cultural techniques. It does not mean abandoning chemical weed control, just relying on it less. For example:

- You may decide to choose a normal-height wheat or a tall, viny pea variety for a certain field. These crop selections will compete strongly with weeds, possibly allowing you to skip a spray operation.
- You could insert a short-term forage crop into your crop rotation. Studies show that short-term alfalfa stands can reduce wild oat and green foxtail populations by up to 80 percent the year after breaking.
- Early sown barley may give you enough of a "jump" on the weeds that you can avoid herbicide applications.
- Use of vigorous, high-quality seed, sown shallow, can give you better crop competition than poor-quality or deeply sown crop seed.
- Banding nitrogen near the seed can give your crop an advantage over weeds.

Resistance Grouping

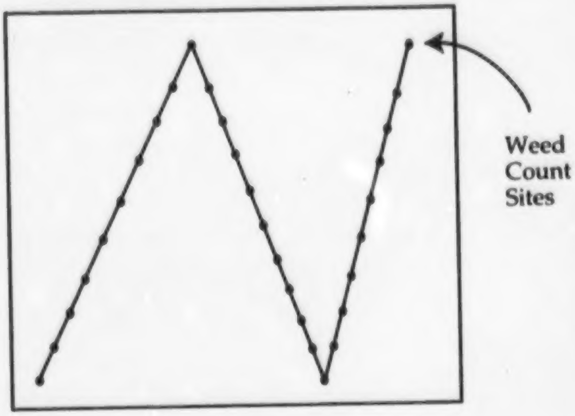
To help you plan your herbicide program, the following table lists "herbicide groups." To slow down the process of developing weed resistance, use products from different groups from year to year on your fields.

Making Spray Decisions

Field Scouting

Field scouting is an important tool for making informed spray decisions. Accurately assessing the type and number of weeds in the field will help you determine if a spray operation is necessary. The scouting pattern diagram on this page provides a guideline for scouting a field. The entire field should be walked to get a feel for the distribution of the weeds present. A minimum of 20 weed counts should be taken across the field. A smaller number may be used, but be aware that accuracy decreases as the number of counts gets smaller. Count the number of weeds in a 1 m^2 or a 0.25 m^2 area and divide the total number of weeds by the number of counts taken to obtain an average for the field. If using 0.25 m^2 samples, make sure to multiply by 4 so your average is for a 1 m^2 area.

Some weeds are not distributed uniformly and may be found in patches (for example, Canada thistle) or in low spots. As well, the type and number of weeds found along the field edges may be very different from those found inside the field. These areas should be considered separate from the rest of the field. If possible, patches, low spots, and field borders should be treated separately, as field wide spraying may not be required. Look out for new invading weeds and patches of herbicide-resistant weeds. Herbicide-resistant weeds and new invaders should be controlled, regardless of their number, to prevent them from spreading and becoming a serious control problem. Mapping your field's weed problems will allow you to monitor the spread of weed patches over time and help you assess the effectiveness of your control program.



Yield Losses Caused by Weeds

Knowing the amount of crop yield loss caused by a given weed density will help you decide if a spray operation is required. The tables on the following pages give an indication of the yield loss caused by some of the important grassy weeds of Manitoba.

THESE TABLES SHOULD BE USED ONLY AS A GUIDE. The figures are based on western Canadian research trials and will not be accurate all of the time. The yield loss values apply only to healthy, well fertilized crops with good stand establishment. Crops that are diseased or emerged unevenly will not compete well with weeds and will suffer larger yield losses than indicated in these tables. The yield loss figures are based on competition from single weed species only. Other weeds, such as wild mustard or Canada thistle, must be controlled if the figures are to be accurate. As well, the tables are based on competition from normal height crops. Semi-dwarf or hybrid varieties may not compete as well with weeds and the figures may not be accurate in these cases.

Table 1. Yield Losses (Percent) in Wheat Caused by Wild Oats.

	Wild Oat Density – Number Per Square Metre																
	1	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
Wild Oats are 1 Leaf Stage Ahead of the Crop	1	2	4	6	8	10	12	14	15	17	19	22	26	29	32	34	37
Wild Oats are the Same Leaf Stage as the Crop	1	1	2	4	5	6	7	8	9	10	11	14	16	18	20	22	24
Wild Oats are 1 Leaf Stage Behind the Crop	0	1	1	2	3	3	4	5	5	6	7	8	10	11	13	14	15

Source: O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)

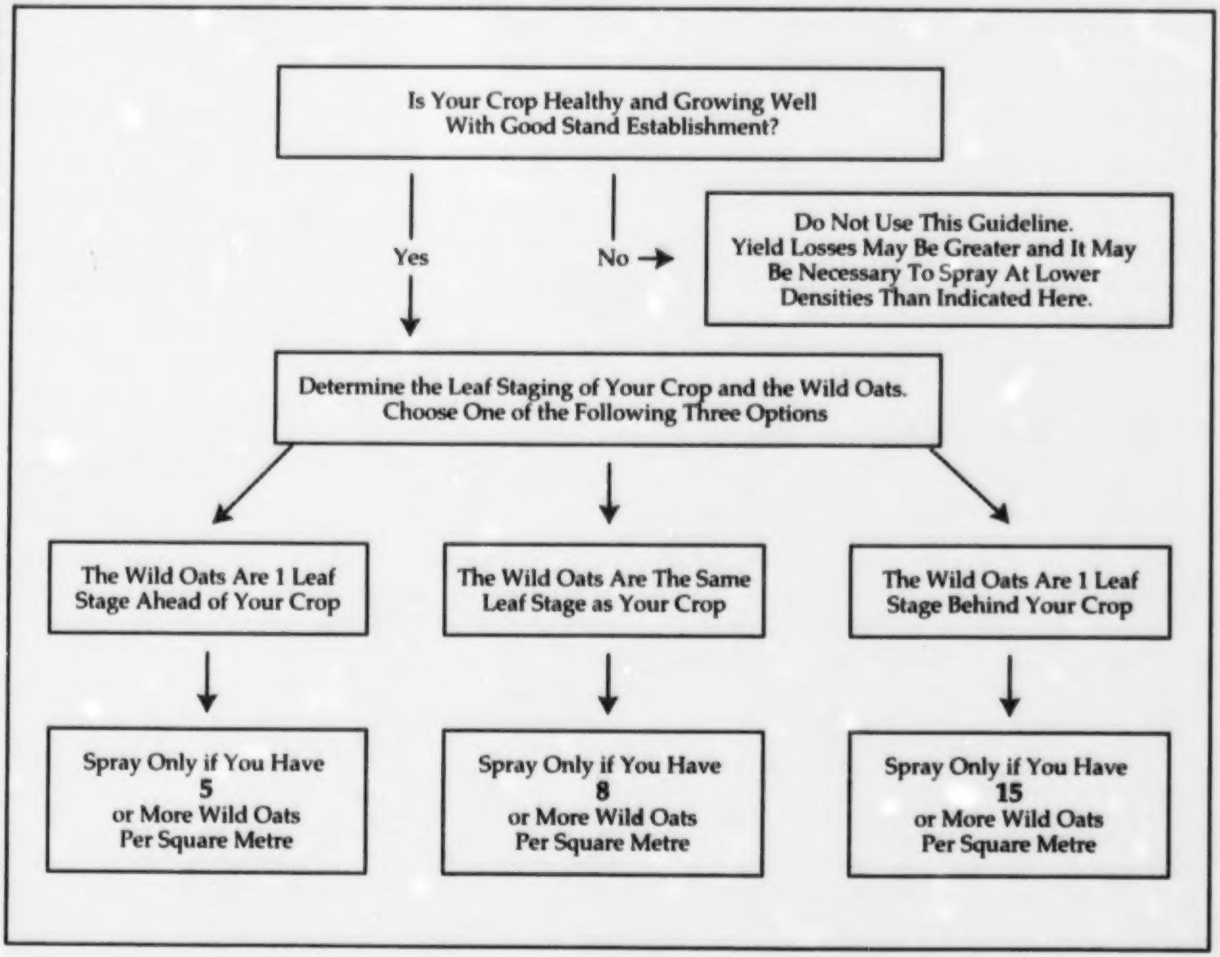
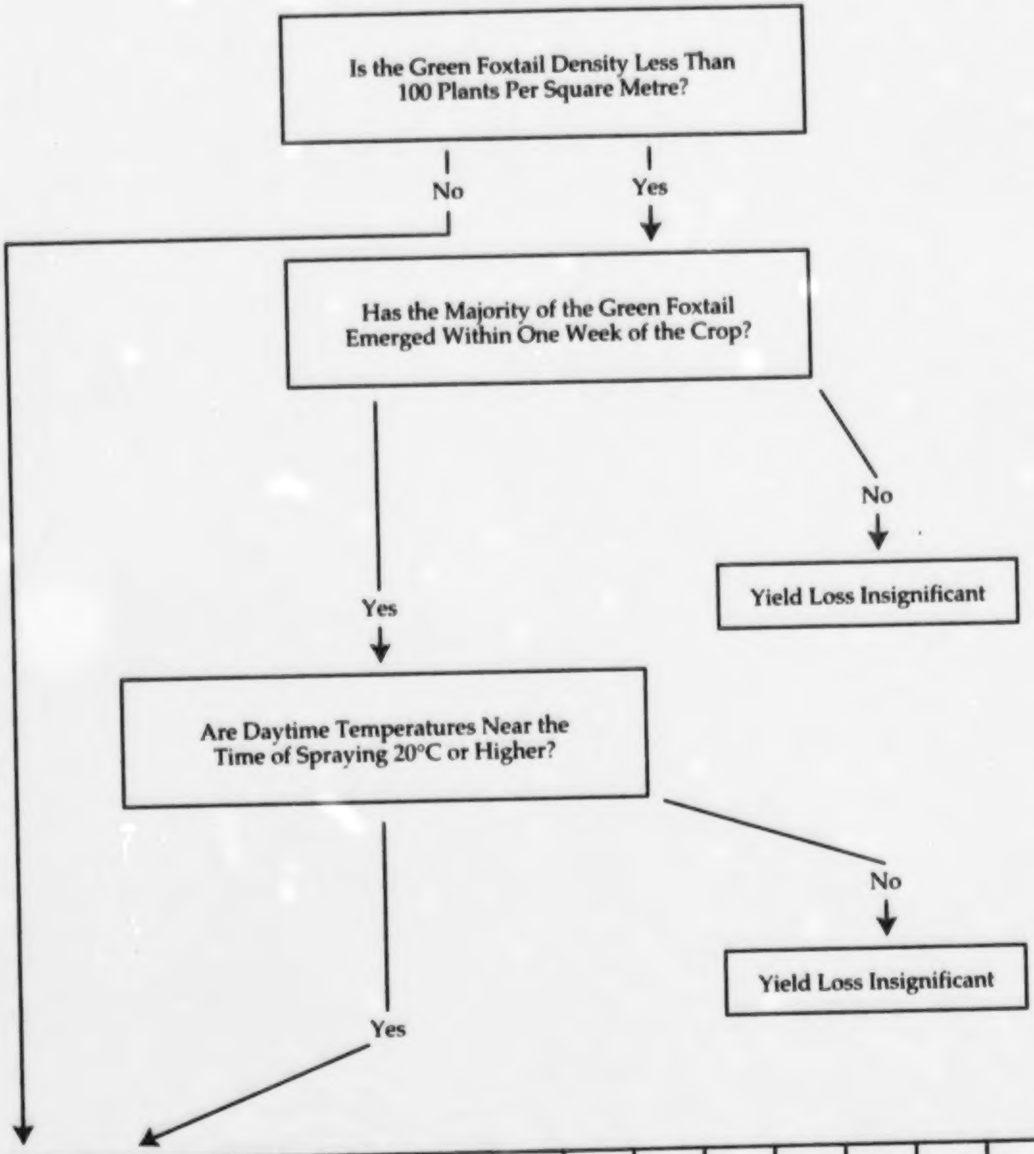

Is Your Crop Healthy and Growing Well With Good Stand Establishment?
Yes
No
Do Not Use This Guideline. Yield Losses May Be Greater and It May Be Necessary To Spray At Lower Densities Than Indicated Here.
Determine the Leaf Staging of Your Crop and the Wild Oats. Choose One of the Following Three Options
The Wild Oats Are 1 Leaf Stage Ahead of Your Crop
The Wild Oats Are The Same Leaf Stage as Your Crop
The Wild Oats Are 1 Leaf Stage Behind Your Crop
Spray Only if You Have 5 or More Wild Oats Per Square Metre
Spray Only if You Have 8 or More Wild Oats Per Square Metre
Spray Only if You Have 15 or More Wild Oats Per Square Metre

Figure 1. Spray Decision Guideline for Wild Oats in Wheat.

Table 2. Yield Losses (Percent) in Wheat Caused by Green Foxtail (Wild Millet)


Is the Green Foxtail Density Less Than 100 Plants Per Square Metre?
No
Yes
Has the Majority of the Green Foxtail Emerged Within One Week of the Crop?
No
Yield Loss Insignificant
Yes
Are Daytime Temperatures Near the Time of Spraying 20°C or Higher?
No
Yield Loss Insignificant
Yes

Green Foxtail Density (no. per square metre)	50	75	100	125	150	175	200	250	300	350	400	450	500
Yield Loss (percent)	2	3	5	6	7	8	9	11	14	16	18	20	23

Source: O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)

Table 3. Yield Losses (Percent) in Barley Caused by Wild Oats.

	Wild Oat Density – Number Per Square Metre																		
	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	100
Wild Oats are 1 Leaf Stage Ahead of the Crop	1	5	10	14	17	20	22	24	26	28	29	31	32	33	34	35	36	37	39
Wild Oats are the Same Leaf Stage as the Crop	0	2	4	6	8	9	11	12	13	15	16	17	18	19	20	21	22	22	25
Wild Oats are 1 Leaf Stage Behind the Crop	0	1	2	2	3	4	4	5	6	6	7	8	8	9	9	10	10	11	12

Source: O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)
Note: Lodging becomes a concern in barley when wild oat densities exceed approximately 20 plants per square metre.

Figure 2. Spray Decision Guideline for Wild Oats in Barley.

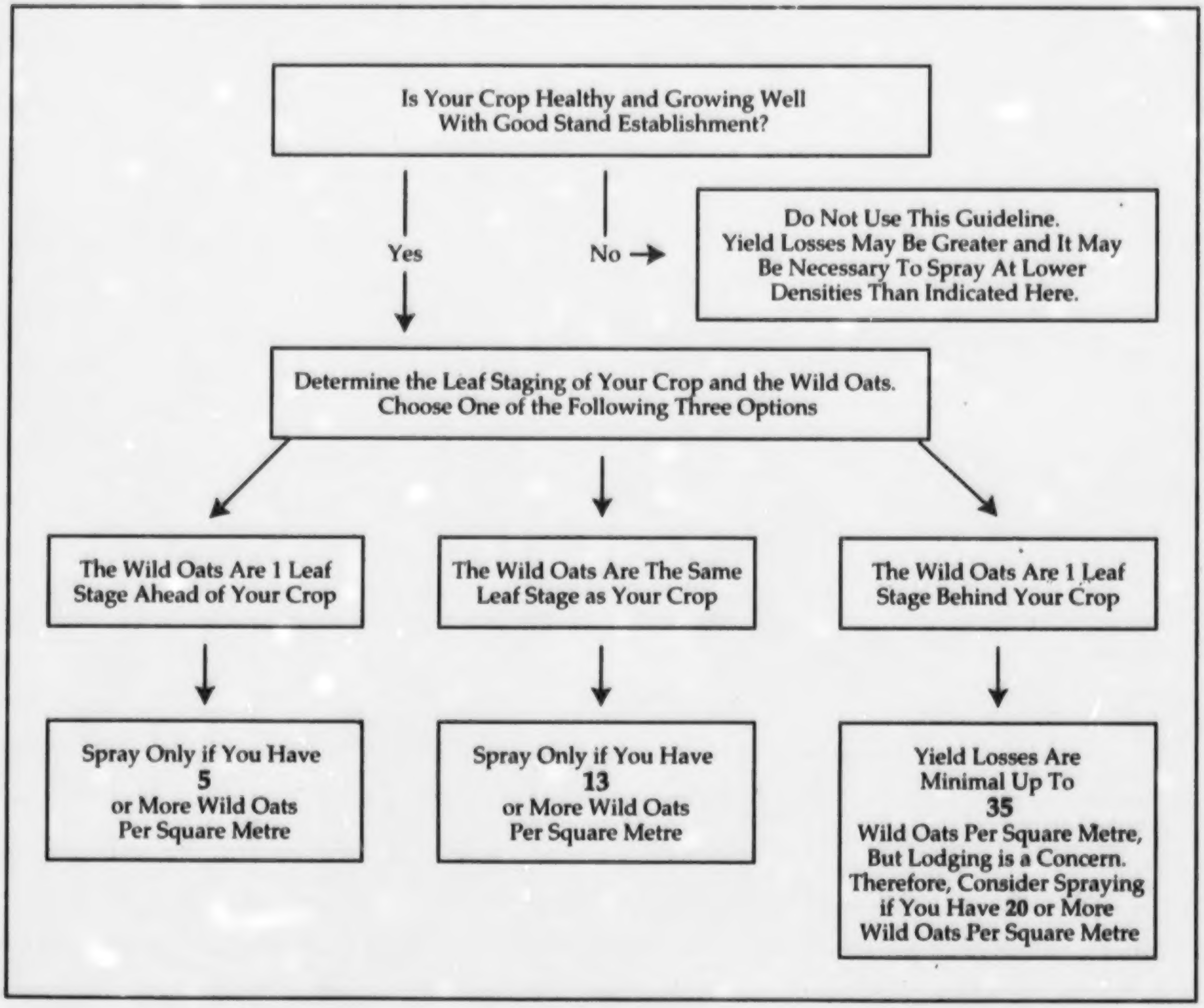
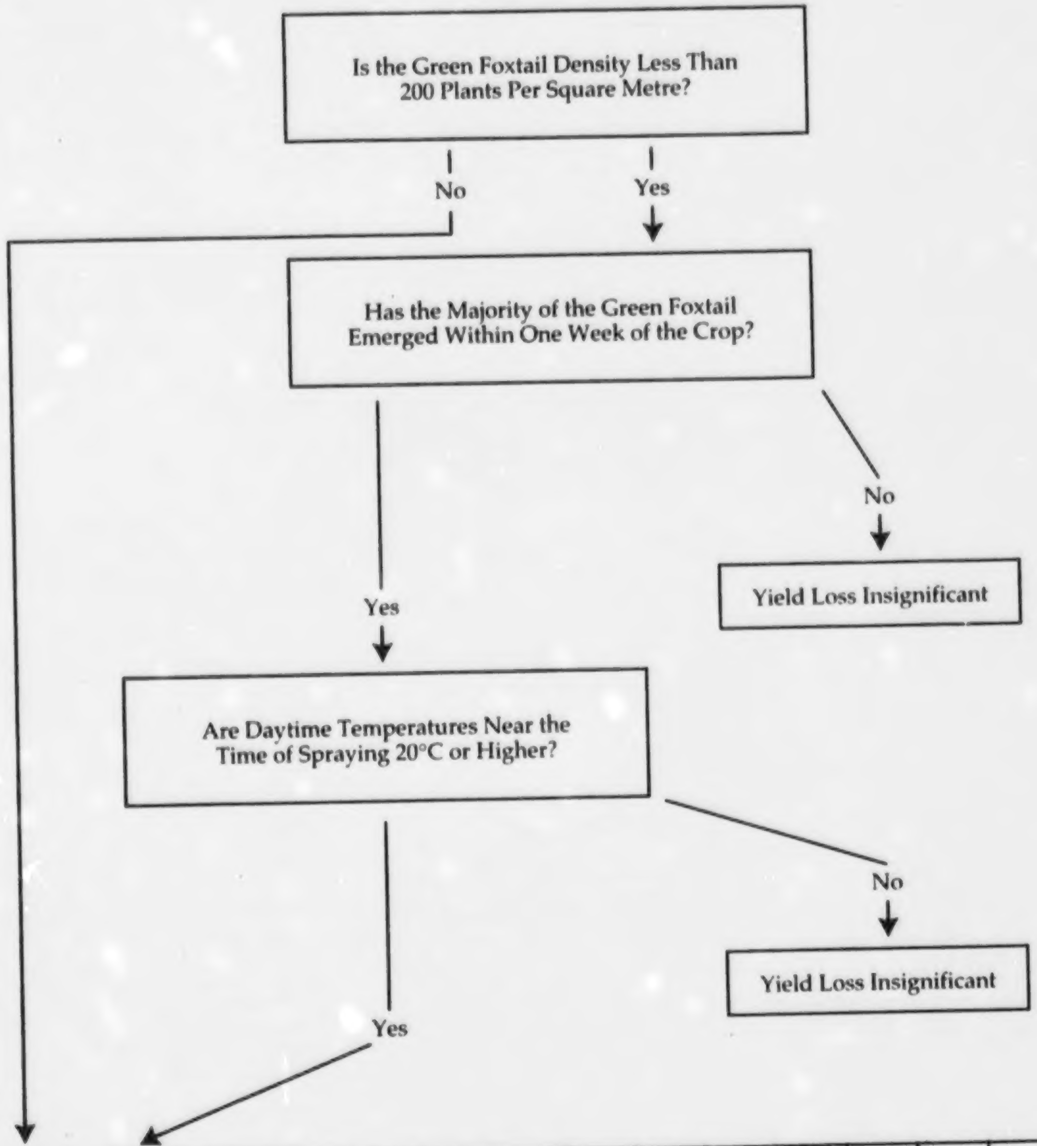

Is Your Crop Healthy and Growing Well With Good Stand Establishment?
Yes
No
Do Not Use This Guideline. Yield Losses May Be Greater and It May Be Necessary To Spray At Lower Densities Than Indicated Here.
Determine the Leaf Staging of Your Crop and the Wild Oats. Choose One of the Following Three Options
The Wild Oats Are 1 Leaf Stage Ahead of Your Crop
The Wild Oats Are The Same Leaf Stage as Your Crop
The Wild Oats Are 1 Leaf Stage Behind Your Crop
Spray Only if You Have 5 or More Wild Oats Per Square Metre
Spray Only if You Have 13 or More Wild Oats Per Square Metre
Yield Losses Are Minimal Up To 35 Wild Oats Per Square Metre, But Lodging is a Concern. Therefore, Consider Spraying if You Have 20 or More Wild Oats Per Square Metre

Table 4. Yield Losses (Percent) in Barley Caused by Green Foxtail (Wild Millet)


Is the Green Foxtail Density Less Than 200 Plants Per Square Metre?
No
Yes
Has the Majority of the Green Foxtail Emerged Within One Week of the Crop?
No
Yield Loss Insignificant
Yes
Are Daytime Temperatures Near the Time of Spraying 20°C or Higher?
No
Yield Loss Insignificant
Yes

Green Foxtail Density (no. per square metre)	50	75	100	125	150	175	200	250	300	350	400	450	500
Yield Loss (percent)	1	2	3	3	4	5	6	7	8	10	11	13	14

Source: O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)

Table 5. Yield Losses (Percent) in Canola Caused by Wild Oats and Volunteer Cereals.

	Weed Density – Number Per Square Metre												
	1	**2**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**25**	**30**
Wild Oats	3	5	6	8	9	10	11	12	13	14	15	16	18
Volunteer Wheat	1	3	6	8	10	11	12	14	15	16	17	19	21
Volunteer Barley	3	5	8	10	12	14	15	17	18	19	20	23	25

Sources: Dew and Keys, Agriculture Canada (Lacombe, Alberta)
O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)

Figure 3. Spray Decision Guideline for Wild Oats and Volunteer Cereals in Canola.

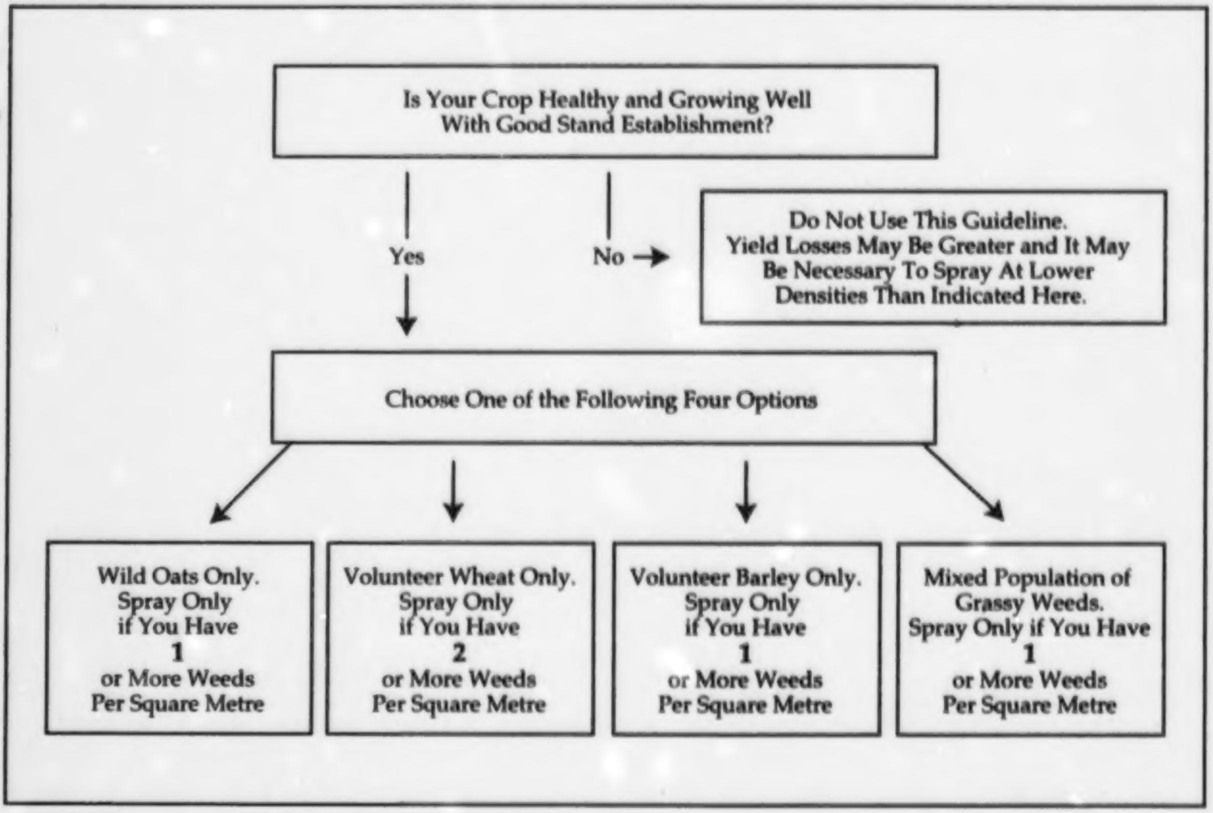
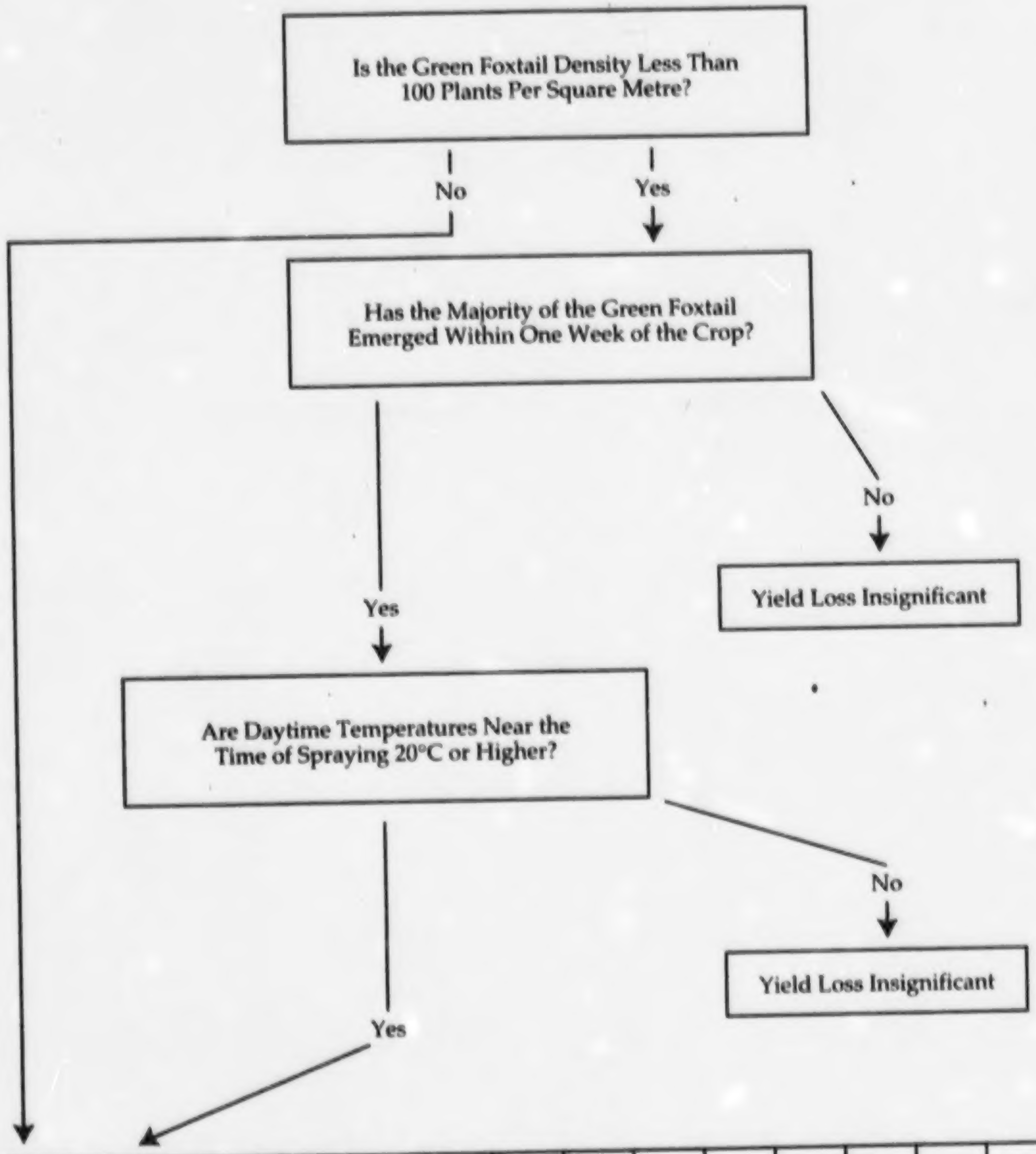

Is Your Crop Healthy and Growing Well With Good Stand Establishment?
Yes
No
Do Not Use This Guideline. Yield Losses May Be Greater and It May Be Necessary To Spray At Lower Densities Than Indicated Here.
Choose One of the Following Four Options
Wild Oats Only. Spray Only if You Have 1 or More Weeds Per Square Metre
Volunteer Wheat Only. Spray Only if You Have 2 or More Weeds Per Square Metre
Volunteer Barley Only. Spray Only if You Have 1 or More Weeds Per Square Metre
Mixed Population of Grassy Weeds. Spray Only if You Have 1 or More Weeds Per Square Metre

Table 6. Yield Losses (Percent) in Canola Caused by Green Foxtail (Wild Millet)


Is the Green Foxtail Density Less Than 100 Plants Per Square Metre?
No
Yes
Has the Majority of the Green Foxtail Emerged Within One Week of the Crop?
No
Yield Loss Insignificant
Yes
Are Daytime Temperatures Near the Time of Spraying 20°C or Higher?
No
Yield Loss Insignificant
Yes

Green Foxtail Density (no. per square metre)	50	75	100	125	150	175	200	250	300	350	400	450	500
Yield Loss (percent)	3	4	5	6	8	9	10	13	15	18	20	23	25

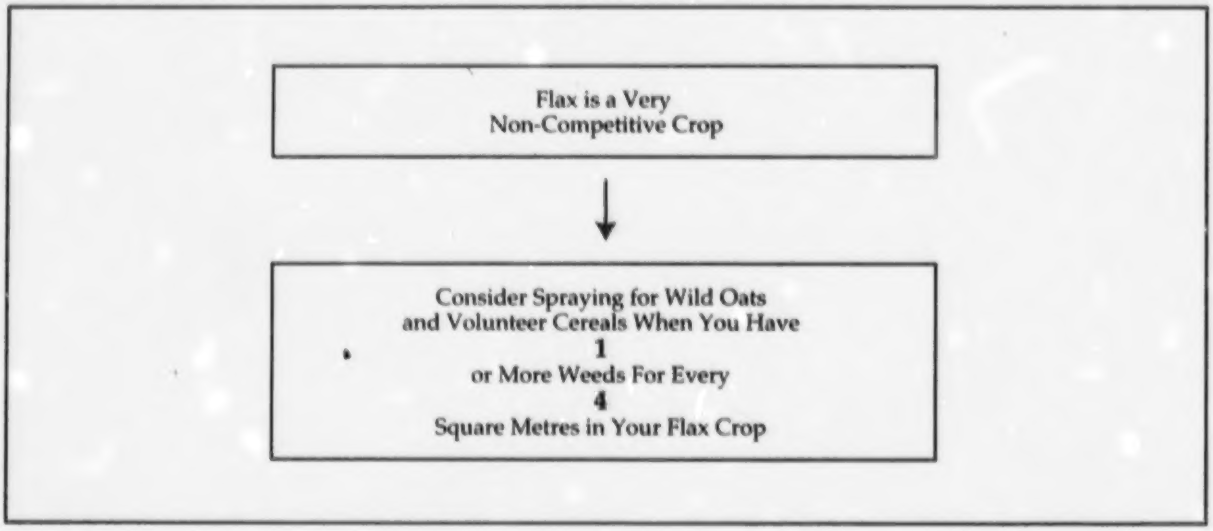
Source: O'Donovan, Alberta Environmental Centre (Vegreville, Alberta)

Table 7. Yield Losses (Percent) in Flax Caused by Wild Oats and Volunteer Cereals.

	Weed Density – Number Per Square Metre									
	1	2	3	4	5	6	7	8	9	10
Wild Oat	6	8	10	12	13	15	16	17	18	19
Volunteer Wheat	6	11	15	18	22	24	27	29	31	33
Volunteer Barley	6	12	16	21	24	28	31	34	36	39

Sources: Dew and Keys, Agriculture Canada (Lacombe, Alberta)
Friesen et al., University of Manitoba (Winnipeg, Manitoba)

Figure 4. Spray Decision Guideline for Wild Oats and Volunteer Cereals in Flax.



Flax is a Very
Non-Competitive Crop

Consider Spraying for Wild Oats
and Volunteer Cereals When You Have
1
or More Weeds For Every
4
Square Metres in Your Flax Crop

Deciding to Spray – Economic Thresholds and Herbicide Resistance

An **economic threshold** is the level of infestation at which lost yield exceeds the cost of the chemical and its application. Determining the economic threshold will help you decide if a spray operation is necessary.

The following example outlines how to determine an economic threshold:

You have a wild oat problem in your wheat. After a thorough field scouting you have determined that your field has an average density of 35 wild oats per square metre. You know that the crop and weeds are at the same leaf stage. Using Table 1, choose the "Same Leaf Stage" row and read across to **35** wild oats per square metre. You will find that your yield loss will be about **18** percent.

You think it could be a 40 bushel per acre wheat crop, and expect to get $3 per bushel for it. Therefore:

40 bushels x 0.18 (percent of expected yield loss) =
7.2 bushels per acre of lost yield

7.2 bushels x $3 per bushel =
$21.60 per acre of lost income

Now find out the price of your herbicide. Most wild oat herbicides for wheat cost about $15 per acre. In this case, lost income exceeds the cost of the herbicide and application, so spraying would be justified.

Alternatively, you may want to use the figures provided with some of the yield loss tables. These figures provide flowcharts to assist you in making spray decisions. In some cases the flowcharts may indicate to spray when you do not have an economic threshold weed density, but most times they will prevent you from spraying unnecessarily.

Another factor to consider when deciding whether to spray is your herbicide rotation. A one in three rotation of herbicide groups is currently recommended to delay the development of herbicide resistance for weeds such as wild oats and green foxtail. Skipping a spray operation will give you an extra year of flexibility in your herbicide rotation. This means that you have one extra herbicide group to choose from the year after you skipped the spray operation. When making spray decisions, the ability to rotate herbicides should be considered in addition to the economics of spraying.

Making the Spray Decision

Remember that economic thresholds should be used only as guides when making a spray decision. Lost income caused by dockage or downgrading must also be considered. **FIELDS THAT ARE NOT SPRAYED THIS YEAR HAVE A HIGHER POTENTIAL FOR PROBLEMS THE FOLLOWING YEAR BECAUSE OF WEED SEED RETURN.** A farmer's experience and common sense play an important role when deciding to spray. Used properly, however, the economic threshold can be an important tool in making spray decisions.

Adjuvants and Your Herbicide

Adjuvants are important ingredients in chemical weed control. Many herbicides must be applied with an adjuvant. If it is forgotten, the level of weed control can vary widely, and re-spraying may be necessary.

Most products have adjuvants built into the formulation (e.g. Puma). Other require adjuvant addition (e.g. Refine Extra). Some adjuvants were developed specifically for one herbicide, and these are either pre-packaged with the herbicide, or are identified by name on the label (e.g. Turbocharge for Achieve 40 DG, Amigo for Select).

With some products, adjuvants need to be added only under certain conditions. For example, glyphosate products have built-in adjuvants, but require additional adjuvant when low rates (pre-seeding or chem-fallow), high water volumes, or certain tank mixes are used.

Adjuvants should be added only when required. If one is not required, addition can reduce weed control or injure crops. Product labels will describe when an adjuvant is required, and what type should be used.

There are two main classes of adjuvants: "activators or spray modifiers" (these include surfactants and crop oils), and "utility modifiers" (these include pH adjusters, water conditioners, low-drift adjuvants, and anti-foaming agents). The most important class of adjuvants is the activators. Surfactants, the main group within the activators, are *"surface active agents."* These chemicals produce effects at points where two substances touch, such as between two liquids (herbicide and water) or between a solid and a liquid (herbicide and leaf surface). Some surfactants act as dispersing agents, helping to keep a pesticide suspended in water. Others work on the plant, improving the wetting, sticking and penetrating characteristics of the herbicide droplets. Oil-based adjuvants contain petroleum or vegetable oil plus an emulsifier that suspends the oil in tiny droplets within the spray solution. Oil-based adjuvants typically assist in herbicide penetration into the leaf.

There are two basic type of surfactants (ionic and non-ionic), of which the non-ionic are most common. The following table lists the surfactants registered for use with herbicides in western Canada.

Surfactant and Herbicide Registrations:

SURFACTANT	TYPE	HERBICIDE
Agral 90/ Agsurf	Non-ionic	Ally, Amber, Escort, Glyphosate, Muster, Pinnacle, Pursuit, Prism, Refine Extra, Reglone, Unity
Citowett Plus	Non-ionic	Ally, Amber, Basagran (peas), Escort, Muster, Prism, Refine Extra, Unity
Companion	Non-ionic	Ally, Amber, Muster, Refine Extra, Unity
Enhance	Blend of Ionic and Non-ionic	Glyphosate
Frigate XL	Ionic	Glyphosate
Super Spreader Sticker	Non-ionic	Ally, Amber, Unity
LI 700	Non-ionic	Glyphosate

Oil-Based Adjuvants and Herbicide Registrations:

OIL-BASED ADJUVANTS	
TRADE NAME	**HERBICIDE**
Amigo	Select
Assist	Basagran (all crops), Laddok
Bioveg	Bladex 90 DF
Crop oil or Corn oil	Atrazine
Hi-Mix, Sure-Mix	Assure II, Freedom Gold, Muster Gold II
Merge	Accord, Anthem, Flaxmax Ultra, Odyssey, Poast Ultra, Sundance
Score	Horizon
Turbocharge	Achieve, Venture
XA Oil Concentrate	Basagran

Mixing Pesticides

The ability to control a broad range of weeds or other pests in one pass is the advantage that a mix of two or more products allows. If tank mixing is not done in the correct order, the result could be a tank-load of material that may not control the target pests, cause injury to the crop, plug nozzles, or leave an undesirable residue in the tank that will require extensive cleaning. Mistakes like these are costly, could put the user at unnecessary risk of exposure to the products, or create an environmental disposal problem.

To avoid mixing that may result in incompatibilities, **always consult the label of the products that are being used** to learn the correct order. **Remember to add all like components at the same stage of mixing.** The list below is a general rule-of-thumb for mixing pesticides:

1. Fill the spray tank with 1/4 to 3/4 the amount of water required for the application and turn on the sprayer agitation. Check the products that are being used for the correct amount to add. Once agitation has begun, maintain until the tank is emptied.
2. Add any fertilizer or pH adjuster additives to the tank.
3. Add any wettable powders, water dispersible granules (DF, DG, or WDG), or flowable liquid suspensions to the tank. Add dry products slowly to prevent clogged return lines. Allow sprayer to agitate for a few minutes, allowing the product to become completely suspended in the tank, before adding the next component.
4. Shake any containers of liquid pesticide thoroughly **before adding** to ensure they are well mixed.
5. Add any pesticides that are solutions (SN) (i.e. amines and salts)
6. Add emulsifiable concentrates (EC, SC) (i.e. esters)
7. Add any surfactants or other adjuvants.

Remember to always consult the label for compatible mixes and recommended mixing order.

Many pesticides will break down if left in the tank for an extended period. Try not to mix any more than you can spray at one time. If you need to stop spraying for a short time, leave the sprayer agitation running to keep products from settling or separating in the tank.

Crop and Herbicide Recommendation Tables

The ratings in the following charts give general comparisons based on rates, timing and other application instructions and precautions as outlined in this Guide.

The ratings for crop tolerance and weed control are explained below. Where ratings are not given, a dot (•) will indicate if the weed is listed on a product label. Where rate ranges are listed for controlling a given weed, ratings are based on results achieved with the higher rate.

RATING	CROP TOLERANCE	WEED CONTROL
E - Excellent	Consistently exhibits a high degree of tolerance over a wide range of growing conditions.	Consistently provides a high degree of control over a wide range of growing conditions.
G - Good	Exhibits good crop tolerance under most growing conditions.	Provides good control under most growing conditions.
F - Fair	Tolerance is acceptable depending on growing conditions.	Control is acceptable depending on growing conditions.
P - Poor		Provides suppression, but control is often unacceptable.

All ratings for flixweed, shepherd's-purse and stinkweed refer to control of spring seedlings only. Overwintered rosettes will not be controlled.

All ratings are primarily based on the use of the herbicides on their own. Tank mixing herbicides may reduce the control of one or both tank mix partners, or result in a reduced level of crop safety.

Weed Control Tables

Table 1. Weed Control in Barley

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's Purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Corn	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Sunflowers
2,4-D	42	G								G	P	E			E		E			G	E		E	P	P				P
Accord[9]	47	E	G	E[7]					E																		G		
Achieve	49	G	F	G	G																								
Achieve Extra Gold	51	G	F	G	G	E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Avadex BW	68	E			G																								
Ally Toss-N-Go + 2,4-D	53	G				F		G				E	G	G	E		E	E		G	E	G	E	F	F			G	
Assert	60	G			G	P											G						G						
Attain	66	G				G		G	E	G	G[6]	E	G	E	E	•	E	E		G	G	G	E	P	P		•	•	
Avenge	72	G			G																								
Banvel II +MCPA/2,4-D	73	F				G			G	G	P	E	F[3]	G	E		E	G		G	E	G	E	F	F			G	F
Breaker	81							•		•		•	S				•	•			•	•	•					•	
Buctril M	83	E				E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Champion Extra	86	G	G	E	G	G		E	F				E	E	E	F	E	E		E	G	E	E	F	F			G[5]	
Champion Plus	87	G		E	G	G		G		G		E	E	F	E		E	E		G	E	E	E		P			G[4]	E
Curtail M	89	G				F					G[6]	E		P	E		G	F			E	F	E	F	G			F	G
Dichlorprop + 2,4-D	90	G				G	G			G		E		G	E	F	E	G		G	E	G	E	F	F			G	G
DyVel	93	F				G			F	G		E	F	G	E		E	G		G	E	G	E	F	F			F	F
DyVel DS	95	F				G			F	G		E		G	E	F	E	G		G	E	G	E	F	F				F
Express Pack	104	G				F						E		G	E		E	G		G	E		E		F				G
Fortress	107	G		G	G	P								P	P			P		P									
Glyphosate (preharvest)	122										G[8]								G					F	G				
Hoe-Grass 284	132	G	G	G	G																					F			
Hoe-Grass II	134	G	G	G	G	G	P							F	G		F	F		G		G	F			F			
Linuron + MCPA amine	144	F		P		G		G		G		E	F	G	E		E	G			E	F	E						
Lontrel	147	G				F																		F	G				
MCPA	149	E								G	P	E			E		E				E		E	P	P				P
MCPAK	149	E								G		E	F		E		E				E		E	P	P				
Mecoprop	154	G						E	G						E		E								P				
Pardner	159	E				G				F				F	G		F	F		G		G	F						
Prestige	167	E				E		G	E		G[6]	E	G	E	E	•	E	G			E	G	E	E	E		•	E	E
Prevail	168	G		G	G	F					G[6]	E		P	E		G	F			E	F	E	F	G			F	
Puma[120] Super	177	•	•	•[7]	•																								
Puma Super	179	G	G	E[7]	G																								
Refine Extra Toss-N-Go	183	E				G		E	F			E	E	E	E	F	E	E		E	G	E	E	F	F			G[5]	•
Sencor	193	F					G	G					F		G		G	F		G		G	G					G	
Stampede EDF + MCPA/2,4-D or Refine Extra	196	F		G		G				G[2]		G		F	E		G	G		G[2]	G	G	G					G	G[2]
Target	200	F				G	G		G			E	F	G	E		E	G		G	E	G	E	F	F			G	G
Thumper	201	E				E	F			G		E		G	E		E	G		G	G	G	G					G	G
Trifluralin (foxtail control)	203	E		G																									
Trifluralin (grassy and broadleaf)	205	F	G	G	F	F		G							G			G		G									
Unity[1]	210	E				G		G	G			G	E	G	G		E	G			G	G	E					G	

[1] Not for use in Manitoba. [2] 2,4-D mixes only. [3] MCPA K mixes only. [4] May not give satisfactory control of Smart canola varieties.
[5] Will not control Smart canola varieties. [6] Spring seedlings only. [7] Green Foxtail only. [8] Not registered for control with all glyphosate products. See glyphosate sections for details. [9] Not for use on malting barley. • Registered for control, ratings not yet developed. S- suppression.

Table 2. Weed Control in Oats

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Sunflowers
Banvel II + MCPA	73	F				G			G	G	P	E	F[2]	G	E		E	G		G	E	G	E	F	F		G	F
Buctril M	83	E				E	F			G		G		G	E		E	G		G	G	G	G	P	P		G	G
Curtail M	89	G				F					G[4]	E		P	E		G	F			E	F	E	F	G		F	G
DyVel	93	F				G			F	G		E	F	G	E		E	G		G	E	G	E	F	F		F	F
Linuron + MCPA amine	144	F		P		G		G		G		E	F	G	E		E	G			E	F	E					
Lontrel	147	G				F																		F	G			
MCPA	149	E								G	P	E			E		E				E		E	P	P			P
MCPAK	149	E								G		E	F		E		E				E		E	P	P			
Mecoprop	154	G						E	G						E		E								P			
Pardner	159	E				G				F				F	G		F	F		G		G	F					
Refine Extra Toss-N-Go	183	G				G		E	F			F	E	E	E	F	E	E		E	G	E	E	F	F		G[3]	•
Glyphosate (pre-harvest)[5]	122										G[6]								G					F	G			
Stampede EDF + MCPA / Refine Extra	196	F		G		G						G		F	E		G	G			G	G	G				G	
Target	200	F				G	G		G			E	F	G	E		E	G		G	E	G	E	F	F		G	G

[2] MCPAK mixes only. [3] Will not control Smart canola varieties. [4] Spring seedlings only. [5] Not all products registered for use in oat. See glyphosate sections for details. [6] Not registered for control with all products. See glyphosate sections for details. • Registered for control, ratings not yet developed. S – Suppression.

Table 3. Weed Control in Rye or Triticale

HERBICIDE	PAGE	Crop Tolerance - Rye	Crop Tolerance - Triticale	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Corn	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Sunflowers
Achieve[3]	49	G	G	F	G	G																								
Achieve Extra Gold[1,4]	51	G	G	F	G	G	E	F			G		G		G	E		E	G		G	G	G	G	P	P			F	G
Avenge[1]	72	G	G			G																								
Banvel II + 2,4-D[2,4]	73	F					G			G	G	P	E		G	E		E	G		G	E	G	E	F	F			G	G
Buctril M[1,4]	83	E					E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Hoe-Grass 284[3]	132	G	G	G	G	G																					F			
Hoe-Grass II[2]	134	G	G	G	G	G	G	P							F	G		F	F		G		G	F			F			
MCPA[3,4]	149	E									G	P	E			E		E				E		E	P	P				P
Pardner[1]	159	E	E				G				F				F	G		F	F		G		G	F						
2,4-D[3,4]	42	G									G	P	E			E		E			G	E		E	P	P				

[1] Fall rye only. [2] Spring rye only. [3] Fall and Spring rye. [4] Rye only; not registered for triticale. • Registered for control, ratings not yet developed.

Table 4. Weed Control in Winter Wheat

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-Purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Corn	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Sunflowers
Achieve	49	G	F	G	G																								
Achieve Extra Gold	51	G	F	G	G	E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Avenge	72	G			G																								
Banvel II + MCPA/2,4-D	73	F				G			G	G	P	E	F[1]	G	E		E	G		G	E	G	E	F	F			G	F
Buctril M	83	E				E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Dichlorprop-D + 2,4-D	90	G				G	G			G		E		G	E	F	E	G		G	E	G	E	F	F		P	G	G
DyVel	93	F				G			F	G		E	F	G	E		E	G		G	E	G	E	F	F			F	F
DyVel DS	95	F				G			F	G		E		G	E	F	E	G		G	E	G	E	F	F			•	F
Hoe-Grass 284	132	G	G	G	G																					F			
MCPA	149	E								G	P	E			E		E				E		E	P	P				P
Pardner	159	E				G				F				F	G		F	F		G		G	F						
Refine Extra Toss-N-Go	183	G				G		E	F				E	E	E	F	E	E		E	G	E	E	F	F			G[2]	•
Sencor	193	F										F									F		G						
Target	200	G				G	G		G			E	F	G	E		E	G		G	E	G	E	F	F			G	G
2,4-D	42	G								G	P	E			E		E			G	E		E	P	P				

[1] MCPAK mixes only. [2] Will not control Smart canola varieties. • Registered for control, ratings not yet developed.

Table 5. Weed Control in Spring Wheat

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Corn	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Sunflowers
2,4-D	42	G								G	P	E			E		E			G	E		E	P	P				
Accord	47	E	G	E[1]					E																		G		
Achieve	49	G	F	G	G																								
Achieve Extra Gold	51	G	F	G	G	E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Ally Toss-N-Go + 2,4-D	53	G				F		G				E	G	G	E		E	E		G	E	G	E	F	F			G	
Amber[7,9]	55	G				G						E		G	P			E		G			E						
Anthem (includes 2,4-D tank mix)	59	G		F	G	G		E	E		G			G	E		E	E	F			G	E	G				E	
Assert	60	G			G	P											G						G						
Attain[7]	66	G				G		G	E	F	G[6]	E	G	E	E	•	E	E		G	G	G	E	P	P		•	•	
Avadex BW	68	G			G																								
Avenge[7,8]	72	G			G																								
Banvel II + MCPA/2,4-D	73	G				G			G	G	P	E	F[3]	G	E		E	G		G	E	G	E	F	F			G	F
Basagran + 2,4-D	77	E								G					G		E	F		G	E		E					E	
Breaker	81							•		•		•[6]	S	•	•		•	•			•	•	•					•	
Buctril M	83	E				E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Curtail M	89	G				F					G[6]	E		P	E		G	F			E	F	F	F	G			F	G
Dichlorprop-D + 2,4-D	90	G				G	G			G		E		G	E	F	E	G		G	E	G	E	F	F		P	G	G
DyVel	93	G				G			F	G		E	F	G	E		E	G		G	E	G	E	F	F			F	F
DyVel DS	95	G				G			F	G		E		G	E	F	E	G		G	E	G	E	F	F			•	F
Express Pack	104	G				F						E		G	E		E	G		G	E		E		F				G
Fortress	107	F		G	G	P								P	P			P		P									
Glyphosate (preharvest)	122										G[4]								G					F	G				
Harmony Total	129	G			E	G		E	F			E	E	E	E	S	E	E		E	G	E	E	F	F			G[5]	
Heritage[9]	130	G	•	E	G	F									G														
Hoe-Grass 284	132	G	G	G	G																					F			
Hoe-Grass II	134	G	G	G	G	G	P							F	G		F	F		G		G	F			F			
Horizon	136	G	•	G	E																								
Laser DF[10]	140	G		G[1]		G		G		G		G	E	F	E		E	E		G	G	G	G	P	P			G[5]	G
Linuron + MCPA amine	144	F		P		G		G		G		E	F	G	E		E	G			F	F	E						
Lontrel	147	G				F																		F	G				
MCPA	149	E								G	P	E			E		E				E		E	P	P				P
MCPAK	149	E								G		E	F		E		E				E		E	P	P				
Mecoprop	154	G						E	G						E		E								P				
Pardner	159	E				G				F				F	G		F	F		G		G	F						
Platinum	163	G		•[1]	E	E	F			G		G		G	E		E	G		G	G	G	G	P	P			G	G
Prestige	167	E				E		G	E		G[6]	E	G	E	G	•	E	G			E	G	E	E	E		•	E	G
Prevail	168	G		G	G	F					G[6]	E		P	E		G	F			E	F	F	F	G			F	
Puma	174	G	G	E[1]	G																								
Puma OnePass	175		•	•[1]	•	•	•			•		•		•	•		•	•		•	•	•	•	•	•			•	•
Puma Super	179	G	G	E[1]	G																								
Puma[120] Super	177		•	•	•																								
Refine Extra Toss-N-Go	183	E				G		E	F			E	E	E	E	F	E	E		E	G	E	E	F	F			G[5]	•
Roundup Fast Forward (preharvest)	188																		G						G				
Sencor	193	F					G	G					F		G		G	F		G		G	G					G	
Stampede EDF + MCPA or 2,4-D or Refine Extra	196	F		G		G				G[2]		G		F	E		G	G		G[2]	G	G	G					G	G
Sundance	198	G		F	G			E	E								E	E	F				E					G[5]	
Target	200	G				G	G		G			E	F	G	E		E	G		G	E	G	E	F	F			G	G
Thumper	201	E				E	F			G		E		G	E		E	G		G	G	G	G					G	G
Trifluralin (foxtail control)	203	E		G																									
Triumph Plus[7,8]	208	G		E	G	G		G		G		E	E	F	E		E	E		G	E	E	E		P			G[5]	E
Unity[9]	210	E				G		G	G			G	E	G	G		E	G			G	G	E					G	

• Registered for control, ratings not yet developed. S – Suppression. [1] Green foxtail only. [2] 2,4-D mixes only. [3] MCPA K mixes only. [4] Not registered for control with all products. See glyphosate sections for details. [5] Will not control Smart canola varieties. [6] Spring seedlings only. [7] Not registered for durum wheat. [8] Not recommended for all spring wheat varieties. Check product listing for details. [9] Not for use in Manitoba. [10] Tank mix with 2,4-D ester when applying to durum wheat.

Table 6. Weed Control in Corn

HERBICIDE	PAGE	Barnyard Grass	Cereal Grains	Foxtail, Green	Foxtail, Yellow	Wild Oats	Quackgrass	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Kochia	Lamb's-quarters	Mustard, Wild	Pigweed, Redroot	Russian Thistle	Shepherd's-purse	Smartweed Annual Species, Lady's-thumb	Sow Thistle (Perennial)	Stinkweed	Sunflower, Volunteer	Thistle, Canada	Volunteer Canola
Accent	46	•		•	S	•	•																			
Atrazine	64					•		•								•	•	•			•					
Banvel II	73							•			•				•	•	•	•			•	S			S	
Banvel II + 2,4-D amine	73							•			•	•	S	•	•	•	•	•	•	•	•	S	•	•	S	•
Basagran	77									•		•				•	•	S	•	•	•		•		S	
Bladex	79	•		•	•			•							•	•	•	•	•	•	•					
Buctril M	83							•	•			•		•	•	•	•	•	•	•	•		•	•		•
Dual II	92	•		•	•													S								
DyVel DS	95							•			S	•		•		•	•	•	•	•	•		•		S	•
Eradicane	101	•	•	•	•	•	S			•						•		•								
Frontier	111			•																						
Laddok	138									•		•				•	•	•	•		•					
MCPB + MCPA	152															•	•	•		•		S	•		S	•
Pardner	159							•				•			•	•	•	•	•		•		•			
Primextra Light	170	•		•	•			•								•	•	•			•					
Roundup Transorb[1]	125	•		•	•		•	•				•				•	•	•			•					
2,4-D	42											•	S	•		•	•		•	•			•	S		

• Controlled S – Suppression

[1] For use on Roundup Ready varieties only.

Table 7. Weed Control in Peas

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp Nettle	Kochia	Lamb's-quarters	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Barley	Volunteer Wheat
Assure II	62	E	G	E[1]	G													F							E	E
Avadex BW	68	E			G																					
Basagran	76	F						F	F	F					F	F	P		F	F	F	F		P		
Edge	96	G	E	E	G	G		G	P				P	G	E		G		P		P				P	F
Fusion	114	E	G	E[1]	G																				E	E
Glyphosate (preharvest)	122										G[2]							G					F	G		
Hoe-Grass 284	132	G	G	G	G																					
MCPA Sodium Salt / Amine	149	F										P			P	G				P		P				
MCPB + MCPA	152	F											F		G	G	G			G		G	P	P		
Odyssey	158	G	G	E[1]	G	P		E	E			E	F	G	P	E	E		F	F	G	E			G	G
Pea Pack	161	G													G	E	G					G				
Poast Ultra	168	E	E	E	G													F							E	E
Pursuit	181	G		F[1]	F	G		G	G				G		P	E	G			G	G	E				
Roundup Fast Forward (preharvest)	188																	G						G		
Select	191	E	E	E	G													F							E	E
Sencor	193	F						G					F		G	G					G	G				
Trifluralin	203	G	G	G	F	F		G							G		G		G							
Venture DG	213	E	E	F	G													F							E	E

[1] Green foxtail only. • Registered for control, ratings not yet developed. S – Suppression

[2] Not registered for control with all products. See glyphosate sections for details.

Table 8. Weed Control in Other Pulses

HERBICIDE	PAGE	CROP: Bean, Dry	Fababean	Lentil	Chickpea	Soybean	Sweet White Lupin	ANNUAL WEEDS: Barnyard Grass	Foxtail, Green	Foxtail, Yellow	Wild Oat	Buckwheat, wild	Chickweed	Cleavers	Cocklebur	Hemp-nettle	Kochia	Lamb's-quarters	Mustard, Wild	Nightshade, Hairy	Pigweed, Redroot	Russian Thistle	Shepherd's Purse	Smartweed, Annual Species	Stinkweed	Volunteer Barley	Volunteer Wheat	PERENNIALS: Canada Thistle	Dandelion	Perennial Sow-thistle	Quackgrass
Assure II	62			X		X		G	E		G															E	E				F
Basagran	77	X	X			X							F	F	F			F	F	F	P	F	F	F	F			P			
Dual II	92	X				X	X	G	G	G											P										
Edge	96	X		X		X		E	E	E	G	G	G	P		P	G	E			G	P		P		P	F				
Eptam	99	X						G	G	G	G		G					G			G					F	F				
Frontier[1]	111	X							•																						
Fusilade II	112					X		E	F	F	G															E	E				F
Fusion	114			X				G	E		G															E	F				
Glyphosate (preharvest)	122	X		X		X																						G	G[4]	F	G
Hoe-Grass 284	132	X	X	X		X		G	G	G	G																				
Linuron	144					X[2]	X[2]	S	•	•		•	•								•		•	•	•						
Pinnacle	162					X												•	•		•			•							
Poast Ultra	165	X	X	X	X	X		E	E	E	G															E	F				F
Pursuit[3]	181	X																		G											
Roundup FastForward (preharvest)	188	X		X																								G			G
Select	191			X	X	X		E	E	E	G															E	E				
Sencor (post-emergence)	193			X	X								F			F		F	F					F	F						
Sencor + Treflan (PPI)	193		X			X		G	G	G	F	F	G			F		G	G		G	G	G	G	G						
Sencor + Edge (PPI)	193		X					G	E	E	G	G	G	F		F	G	E	F		G	F		G	F	F	F				
Trifluralin	203	X	X	X		X		G	G	G	F	F	G					G			G	G									
Venture DG	213			X				E	F	F	G															E	E				F

• Registered for control, ratings not yet developed (S) Registered for suppression. [1] White and Kidney beans only. [2] Pre-emergent surface treatments only.
[3] Pinto, pink an Red beans only. [4] Not registered for control with all products. See glyphosate sections for details. Refer to Pursuit section (p 170) for full list of weeds controlled.

Table 9. Weed Control in Flax and Low Linolenic Acid Varieties of Flax (certain products only, see below)

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green	Foxtail, Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp Nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Barley	Volunteer Wheat
Assure II[1]	62	E	G	E		G														F							E	E
Avadex BW	68	E				G																						
Basagran	77	F							F	F	F					F		F	P		F	F	F	F		F		
Buctril M[1]	83	F					E	F			G		G		G	E		E			G	G	F	G	P	P		
Eptam[3]	99	F	G	G	G	G			G							G			G								F	F
FlaxMax Ultra	105	F	E	E	E	G	F					G[2]	E			E		E	P			E	P	E	P	F	G	G
Fortress	107	G		G	G	G	P								P	P			P		P							
Fusion	114	E	G	E		G																					E	E
Glyphosate (preharvest)[4]	122											G[5]								G					F	G		
Hoe-Grass 284	132	G	G	G	G	G																						
Hoe-Grass II	134	F	G	G	G	G	G	P							F	G		F	P		G		G	F				
Lontrel	147	G					F																		F	G		
MCPA/MCPAK	149	F									G	P	E	F		E		E				E		E	P	P		
Pardner[1]	159	F					G				F				F	G		F	F		G		G	F				
Poast Ultra[1]	165	E	E	E	E	G														F							E	E
Roundup Fast Forward (preharvest)	188																			G						G		
Select[1]	191	E	E	E	E	G														F							E	E
Stampede EDF + MCPA	196	F		G	G		G						G		F	G		G	G			G	G	G				
Trifluralin	203	F	G	G	G	F	F		G							G			G		G							
Venture DG	213	E	E	F	F	G														F							E	E

[1] Registered for use on low linolenic acid varieties of flax. [2] Spring seedlings only. [3] Not recommended for use on flax in Saskatchewan. [4] Not all products registered for use in flax. See glyphosate sections for details. [5] Not registered for control with all products. See glyphosate sections for details.

Table 10. Weed Control in Canola

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green	Foxtail, Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's Purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Barley	Volunteer Wheat
Assure II	62	E	G	E		G														F							E	E
Avadex BW	68	E				G																						
Edge	96	G	E	E	E	G	G		G	P				P	G	E			E		P		P				P	F
Fortress	107	G		G	G	G	P								P	P			P		P							
Freedom Gold²	109	F	E	E		G	G		E					E	E	E		E	E	F	G		E	E			E	E
Fusion	114	E	G	E		G																					E	E
Glyphosate (preharvest)	122											G⁵								G					F	G		
Hoe-Grass 284	132	G	G	G	G	G																						
Liberty¹	142	G		G		G	G		G	G				G	G	G		G	G	F	G	G	G	G	G	F	F³	G³
Lontrel	147	G					F																		G	E		
Muster Gold / Muster Gold II	155	G	G	E		G							G	G				G	P	F			G	F			E	E
Muster Toss-N-Go	156	G											G	G				G	P				G	F				
Odyssey²	158	G	G	E		G	F		E	E			E	G	G	P		E	E		E	E	G	E			G	G
Poast Ultra	165	E	E	E	E	G														F							E	E
Pursuit²	181	G		G		F	G		G	G						P		E	G				G	E			P	P
Roundup Fast Forward (preharvest)	188																			G						G		
Roundup Transorb⁴	125	G	•	G		G	F	G	G	G		S	•	G	G	G	•	G	G	S	G	G	G	G	S	S	G	G
Select	191	E	E	E	E	G														F							E	E
Trifluralin	203	E	G	G	G	F	F		G							G			G		G							
Venture DG	213	E	E	F	F	G														F							E	E

[1] For use **only** on Liberty Link varieties. [2] For use **only** on Smart canola varieties. [3] Ratings based on 1.3 L / acre rate of Liberty. Control may be reduced at lower rates. [4] For use **only** on Roundup Ready canola varieties. [5] Not registered for control with all products. See glyphosate sections for details. • Registered for control, ratings not yet developed. S – Suppression.

Table 11. Weed Control in Potatoes

HERBICIDE	PAGE	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Quackgrass	Chickweed	Dandelion	Hemp Nettle	Lamb's-quarters	Mustard, Wild	Pigweed, Redroot	Pigweed, Prostrate	Purslane	Smartweed (Annual)	Shepherd's-purse	Stinkweed	Volunteer Corn	Volunteer Barley	Volunteer Wheat	Volunteer Canola	Volunteer Triazine Tolerant Canola
Dual II*,+	92	•	•								S										
Eptam 8-E*,+	99	•	•	•	S	•			•		•	•	•					•	•		
Fusilade II	112	•	•	•	S												•	•	•		
Glyphosate (preplant use only)*,+	115		•	•	•		•	•	•	•	•			•	•	•	•[1]	•	•	•[1]	•
Gramoxone / Gramoxone PDQ (pre-emergent use only)*,+	126	•	•	•	S	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
Hoe-Grass 284+	132	•	•	•													•				
Linuron (pre-emergent use only)+	144	S	•			•			•		•		•	•	•	•					
Poast Ultra*,+	165	•	•	•	S												•	•	•		
Prism*,+	172	•	•		•				S		•										
Reglone (desiccant use only)*,+	185																				
Select*,+	191	•	•	•	S												•	•	•		
Sencor*,+	193					•		•	•	•	•			•	•	•				•	

[1] Not including Roundup Ready varieties. • Controlled S – Suppression

* Approved for use by Midwest Food Products

+ Approved for use by McCains

Table 12. Weed Control in Sunflowers

HERBICIDE	PAGE	Crop Tolerance	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Catchfly, Night-flowering	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mallow, Round-leaved	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada	Volunteer Barley	Volunteer Wheat
Assert	60	F															G					G				
Edge	96	G	E	E	G	G		G	P				P	G	E			E		P	P				P	P
Eptam 8E	99	G	G	G	G			G							G			G							F	F
Hoe-Grass 284	132	G	G	G	G																					
Select	191	•	E	E	G														F						E	E
Trifluralin	203	E	G	G	F	F		G							G			G		G						
Venture DG	213	E	E	F	G														F						E	E

Table 13. Weed Control in Special Crops

HERBICIDE	CROP							ANNUAL WEEDS																						PERENNIALS			
	PAGE	Canaryseed	Safflower	Caraway	Coriander	Buckwheat	Mustard	Barnyard Grass	Foxtail, Green	Foxtail, Yellow	Wild Oat •	Buckwheat, wild	Catchfly, night-flowering	Chickweed	Cleavers	Cocklebur	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mustard, Wild	Pigweed, Redroot	Russian Thistle	Shepherd's Purse	Smartweed, Annual Species	Stinkweed	Volunteer Barley	Volunteer Flax	Volunteer Mustard, Canola	Volunteer Wheat	Canada Thistle	Dandelion	Perennial Sow-thistle	Quackgrass
Accord	47	X						G	E						E													G						
Avadex BW	68	X¹					X				G																							
Avenge	72	X									G																							
Banvel II + MCPA	73	X										G			G	G	E	F		E	E	G	G	E	G	E		P	G		F	P	F	
Buctril M	83	X										E	F			G	G		G	E	E	G	G	G	G	G			G		P		P	
Edge	96		X	X	X		X²	E	E	E	G	G		G	P			P	G	E		G	P		P		P			F				
Fortress	107						X		G	G	G	P							P	P			P	P										
Fusion	114						X	G	E		G																							
Hoe-Grass 284	132					X	X	G	G	G	G																							
Linuron (Afolan F only)	144			X	X																•													
Muster Toss-n-Go	156						X³										G	G			G				G	F								
Pardner	159	X										G				F			F	G	F	F	G		G	F								
Poast Ultra	165		X	X	X	X		E	E	E	G																E			E				F
Select	172						X	E	E	E	G																E			E				F
Stampede EDF + MCPA	196	X							G	G		G					G		F	E	G	G		G	G	G								
Target	200	X										G	G		G		E	F	G	E	E	G	G	E	G	E					F		F	
Trifluralin	203		X				X	G	G	G	F	F		G						G		G	G											
Venture	213						X	E	F	F	G																E			E				F

¹ Granular formulation only. ² Yellow mustard only. ³ Brown and oriental only.

Table 14. Weed Control Before Crop Emergence

HERBICIDE	RATE L/acre	PAGE	Brome, Downy	Buckwheat, Wild	Cocklebur	Dandelion	Flixweed	Foxtail Barley	Foxtail, Green	Hemp-nettle	Kochia	Lady's-thumb	Lamb's-quarters	Mustard, Wild	Narrow-leaved Hawk's Beard	Pigweed, Redroot	Quackgrass	Russian Thistle	Shepherd's Purse	Stinkweed	Thistle, Canada	Thistle, Sow (Perennial)	Volunteer Cereals	Volunteer Canola	Volunteer Flax	Wild Oats
Amitrol 240	2.0 to 8.1	57				•															S	S				
Amitrol 240 + Roundup	2.0 + 0.5	57	•			•	•		•	•		•	•	•		•		•		•			•	•	•	•
Banvel II + Glyphosate	0.13 + 0.38	73	•	•			•	S	•		•	•	•	•		•		•		•			•	•		•
Glyphosate + Pardner	0.4 + 0.45	159		•				S	•		•	•	•	•				•		•			•	•[7]		•
Glyphosate	0.51	115	•	•[1]			•	S	•	•	•[2]	•	•	•	•[1]	•	•[4]	•	•[2]	•			•	•	•	•
Gramoxone**	2.2	126	•	•	•		•	S	•	•	•	•	•	•	•	•		•	•	•			•	•	•	•
Gramoxone PDQ		127	•	•			•	•	•	•	•	•	•	•	•	•		•	•	•			•	•	•	•
Rustler*	1.0	190	•	•			•	S[3]	•		•	•	•	•		•		•		•			•	•		•

• Controlled S – Suppression *Prior to seeding wheat, barley, rye, oats and field corn (not sweet corn). ** Prior to crop emergence in beans, corn, potatoes, peas, and soybeans. [1] Use 0.77 L/acre. [2] Use 0.91 L/acre. [3] Use 1.3 L/acre. [4] Use 1.0 L/acre for season long control only. [5] Roundup Dry may also be used. Refer to Roundup Dry section for more information. [6] Touchdown 640 may also be used. Refer to Touchdown section for more information. [7] Not including Roundup Ready varieties.

Table 15. Weed Control in Summerfallow (Chem Fallow)

HERBICIDE	RATE L/acre	PAGE	Brome, Downy	Buckwheat, Wild	Dandelion	Flixweed	Foxtail Barley	Foxtail, Green	Kochia	Lady's-thumb	Lamb's-quarters	Mustard, Wild	Pigweed, Redroot	Quackgrass	Russian Thistle	Stinkweed	Thistle, Canada	Thistle, Sow (Perennial)	Volunteer Cereals	Volunteer Canola	Wild Oats
Banvel II + 2,4-D	0.12 + 0.45	73		•		•			•	•	•	•	•		•	•	S	S			
DyVel DS	0.71	98		•		•			•	•	•	•	•		•	•	S			•	
Express Pack	40 acres/pack	104				•										•					
Heritage[6]	0.52 to 8.9 kg/acre	130		•				•			•		•		•						•
Lontrel	0.34	147		•													•	S			
Glyphosate[4]	0.51	115	•	•[1]		•	S	•	•[2]	•	•	•	•		•	•			•	•[7]	•
Glyphosate + 2,4-D amine (500 g/L)[4]	0.40 + 0.49	115				•		•	•	•	S	•	•		S	•			•	•	•
Glyphosate + Banvel II[4]	0.40 + 0.12	115		S		•		•	•	•	•	•	S		•	•			•	•	•
Glyphosate + Pardner[4]	0.40 + 0.51	115		•				•	S	•		•	S			•			•	•	S
Rustler	1.01	190	•	•		•	S[3]	•	•	•	•	•	•		•	•			•	•	•
Target	0.81	200		•		•			•	•	•	•	•		•	•	S	S		•	

• Controlled S – Suppression [1] Use 0.77 L/acre for control of wild buckwheat. [2] Use 0.91 L/acre for control of kochia. [3] Use 1.3 L/acre Rustler for suppression of foxtail barley. [4] See glyphosate section. [6] Not for use in Manitoba. [7] Not including Roundup Ready canola.

Table 16. Weed Control in Fall Stubble

HERBICIDE	PAGE	Flixweed	Narrow-leaved Hawk's Beard	Shepherd's-purse	Stinkweed	Canada Thistle	Quackgrass	Dandelion
2,4-D	40	•		•	•	S		S
2,4-DB	89		•					
Amitrol 240	53					S		
Banvel II	67					S		S
Banvel II + Roundup Transorb	67	•		•	•	S	S	
Banvel II + Touchdown 480/640	67	•		•	•	S	S	
DyVel DS	85	•		•	•	S		
Glyphosate	161					S	•	•
MCPA	127	•		•	•	S		S
Target	179	•		•	•	S		
Touchdown 480/640	182					S	•	•

• Controlled

S – Suppression. Levels of suppression vary depending on the product and growing conditions in the fall. Regrowth and in-crop treatments can be expected.

Table 17. Weed Control in Grass Pastures and Hayfields

HERBICIDE	RATE L/acre or kg/acre	PAGE	Absinth	Bindweed, Field	Burdock	Canada Thistle	Dandelion	Dock, Curled	Daisy, English	Flixweed	Foxtail Barley	Gumweed	Hawk's Beard, Narrow-leaved	Knapweed	Leafy Spurge	Nodding Thistle	Poplar	Pussy Toes	Red Bartsia	Sage, Pasture	Sow-thistle, Perennial	Snowberry	Stinkweed	Tansy	Wild Rose	Willow	Wormwood, Biennial
2,4-D (500 g/L)	0.57 - 0.81	42			•					•									•								
2,4-D (500 g/L)	0.91	42			•					•									•				•				
2,4-D (500 g/L)	1.82	42			•			•		•									•				•				
2,4-DB	0.71 - 1.72	42						●					●										•				
Banvel II	0.85	73																									
Banvel II	1.86	73																									
Banvel II + 2,4-D	0.85 + 0.89	73			•					•									•				•				
Banvel II + 2,4-D	0.85 + 1.62	73			•					•									•			•	•		•		
Escort	0.010 - 0.012	102																				•			●		
Kerb	0.36 - 0.45	137									•																
MCPA (500 g/L)	0.7 - 1.9	149								•					●								•				•
MCPB + MCPA	1.11 - 1.72	152																					•				

• Controlled. ● Controlled by the highest rate within this range. Top growth suppression.

Table 18. Weed Control in Shelterbelts

HERBICIDE	USE				SHELTERBELT SPECIES												WEEDS																				
	PAGE	Before Planting	After Planting (New & Established)	Established	American Elm	Birch	Caragana	Crabapple	Green Ash	Juniper	Lilac	Manitoba Maple	Poplar	Scots Pine	Siberian Elm	Willow	Barnyard Grass	Foxtail, Green and Yellow	Wild Oats	Buckwheat, Wild	Chickweed	Cleavers	Cocklebur	Dandelion	Flixweed	Hemp-nettle	Kochia	Lamb's-quarters	Mustard, Wild	Pigweed, Red Root	Quackgrass	Russian Thistle	Shepherd's-purse	Smartweed, Annual Species	Stinkweed	Thistle, Sow (Perennial)	Thistle, Canada
Amitrol 240	59			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Casoron	85		•		•		•	•	•	•	•	•			•	•		•		•	•						•	•	•	•	•		•	•			
Gramoxone	126		•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•		•	•	•	•		
Linuron	144			•	•		•		•			•		•	•	•	•	•		•	•						•	•		•				•	•		
Princep Nine-T/ Simazine 80W/ Simazine 480	171			•	•		•		•			•			•		•	•[1]	•	•								•						•			
Roundup Transorb/ Credit	115	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Trifluralin Liquids	203	•		•	•		•		•					•	•		•	•	•	•	•							•		•		•					

[1] Yellow foxtail only.

Herbicide Formulations and Companies

Product	*Common Name*	*Formulation*	*Company*
2,4-D	2,4-D	500, 600, 700 SN, EC	Various
Accent	nicosulfuron	75% DF	DuPont
Accord	quinclorac	75% DF	BASF
Achieve	tralkoxydim	80% DG	Zeneca
Achieve Extra Gold	tralkoxydim +	40% DG	Zeneca
	bromoxynil + MCPA E	280 g/L + 280 g/L EC	
Advance	trifluralin	10% G	Dow AgroSciences
Afolan F	linuron	480 g/L F	AgrEvo
Ally Toss-N-Go	metsulfuron methyl	60% DF	DuPont
Amber	triasulfuron	75% DG	Novartis
Amitrol 240	amitrole	240 g/L SN	Nufarm
Anthem	sulfosulfuron + 2,4-D E	75% DG + 700 g/L EC	Monsanto
Assert 300-SC	imazamethabenz	300 g/L SC	Cyanamid
Assure II	quizalofop-p-ethyl	96 g/L EC	DuPont
Atrazine	atrazine	480 g/L F	Novartis, UAP
		90% DG	Novartis
Attain	fluroxypyr + 2,4-D E	180g/L + 564 g/L EC	Dow AgroSciences
Avadex BW	triallate	400 g/L EC, 10% G	Monsanto
Avenge 200-C	difenzoquat	200 g/L SN	Cyanamid
Banvel II	dicamba	480 g/L SN	BASF
Basagran	bentazon	480 g/L SN	BASF
Bladex	cyanazine	480 g/L F, 90% DF	DuPont
Bonanza	trifluralin	400 g/L EC, 10% G	UAP
Breaker	MCPA + Metribuzin	500 g/L SN + 75% DF	IPCO
Buctril M	bromoxynil + MCPA E	280 g/L + 280 g/L EC	Rhone Poulenc
Caliber	2,4-DB	400 g/L EC	UAP
Casoron	dichlobenil	4% G	UAP
Champion Extra	fenoxaprop-p-ethyl	92 g/L EC	DuPont
	thifensulfuron methyl +	50% DF	
	tribenuron methyl	25% DF	
Champion Plus	fenoxaprop-p-ethyl	45 g/L +	DuPont
	+ MCPA E + 2,4-D E +	210 g/L + 70 g/L EC +	
	thifensulfuron methyl	75% DF	
Clovitox Plus	MCPB + MCPA	375 g/L + 25 g/L SN	IPCO
Cobutox 600	2,4-DB	600 g/L EC	IPCO
Compitox	mecoprop	150 g/L SN	Nufarm
Credit	glyphosate	356 g/L SN	Nufarm
Curtail M	clopyralid + MCPA E	50 g/L + 280 g/L EC	Dow AgroSciences
Dichlorprop-D	dichlorprop + 2,4-D E	300 g/L + 282 g/L EC	IPCO
Dual II	metolachlor	935 g/L EC	Novartis
DyVel	dicamba + MCPA K	84 g/L + 336 g/L SN	BASF
DyVel DS	dicamba + 2,4-D A + mecoprop	110 g/L + 295 g/L + 80 g/L SN	BASF
Edge	ethalfluralin	60% DG, 5% G	Dow AgroSciences
Embutox 625	2,4-DB	625 g/L EC	Nufarm
Eptam-8E	EPTC	800 g/L EC	Zeneca
Eradicane-8E	EPTC	800 g/L EC	Zeneca
Estaprop	dichlorprop + 2,4-D E	300 g/L + 282 g/L EC	Nufarm
Express Pack	tribenuron methyl	75% DF	DuPont
	+ 2,4-D E	700 g/L EC	
FlaxMax Ultra	sethoxydim +	450 g/L EC +	BASF
	clopyralid + MCPA E	50 g/L + 280 g/L EC	
Fortress	triallate + trifluralin	10% + 4% G	Monsanto

Product	*Common Name*	*Formulation*	*Company*
Freedom Gold	quizalofop-p-ethyl + thifensulfuron methyl	96 g/L EC + 75% DF	DuPont
Frontier	dimethanamid	900 g/L EC	BASF
Fusilade II	fluazifop-p-butyl	125 g/L EC	Zeneca
Fusion	fenoxaprop-p-ethyl + fluazifop-p-butyl	80.5 g/L + 125 g/L EC	AgrEvo
Glyfos	glyphosate	360 g/L SN	Cheminova
Gramoxone	paraquat	200 g/L SN	Zeneca
Gramoxone PDQ	paraquat + diquat	132 g/L + 66 g/L SN	Zeneca
Harmony Total	clodinafop propargyl + thifensulfuron methyl + tribenuron methyl	240 g/L EC 50% + 25%	DuPont
Heritage	trifluralin	5% G	Dow AgroSciences
Hoe-Grass 284	diclofop methyl	284 g/L EC	AgrEvo
Hoe-Grass II	diclofop methyl + bromoxynil	230 g/L + 80 g/L EC	AgrEvo
Horizon	clodinafop-propargyl	240 g/L EC	Novartis
Kerb 50W	propyzamide	50% WP	Rohm & Haas
Laddok	bentazon + atrazine	200 g/L + 200 g/L SN	BASF
Laredo	glyphosate	356 g/L SN	Monsanto
Laser DF	fenoxaprop-p-ethyl + MCPA E + thifensulfuron methyl	28 g/L + 336 g/L EC + 75% DF	AgrEvo
Lexone DF Toss-N-Go	metribuzin	75% DF	DuPont
Liberty	glufosinate ammonium	150 g/L SN	AgrEvo
Linuron 480	linuron	480 g/L F	UAP
Lontrel	clopyralid	360 g/L SN	Dow AgroSciences
Lorox DF	linuron	50% DF	DuPont
MCPA	MCPA	300,400,500,564 g/L SN, EC	Various
Mecoprop	mecoprop	150 g/L SN	UAP
Muster Gold / Muster Gold II	ethametsulfron methyl + quizalofop-P-ethyl	75% DF + 96 g/L EC	DuPont
Muster Toss-N-Go	ethametsulfuron methyl	75% DF	DuPont
Odyssey	imazamox + imazethapyr	35% + 35% DG	Cyanamid
Pardner	bromoxynil	280 g/L EC	Rhone Poulenc
Pea Pack	metribuzin + MCPA Na	75% DG 300 g/L SN	Bayer
Pinnacle	thifensulfuron methyl	75% DF	DuPont
Platinum	clodinofop propargyl + bromoxynil + MCPA E	240 g/L + EC 280 g/L + 280 g/L EC	Rhone Poulenc
Poast Ultra	sethoxydim	450 g/L EC	BASF
Prestige	fluroxypyr + clopyralid + MCPA E	180 g/L + 50 g/L + 280 g/L EC	Dow AgroSciences
Prevail	tralkoxydim + clopyralid + MCPA E	80% DG + 50 g/L + 280 g/L EC	Dow AgroSciences
Primextra Light	metolachlor + atrazine	330 g/L + 170 g/L F	Novartis
Princep Nine T	simazine	90% DG	Novartis
Prism	rimsulfuron	25% DF	DuPont
Puma / Puma Super	fenoxaprop-p-ethyl	92 g/L EC	AgrEvo
Puma^{120} Super	fenoxaprop-p-ethyl	120 g/L EC	AgrEvo
Puma OnePass	fenoxaprop-p-ethyl + bromoxynil + MCPA E	92 g/L EC 280 g/L + 280 g/L EC	AgrEvo
Pursuit	imazethapyr	240 g/L SN	Cyanamid
Refine Extra Toss-N-Go	thifensulfuron methyl + tribenuron methyl	50% + 25% DF	DuPont
Reglone / Reglone Pro	diquat	200 g/L SN	Zeneca
Rival	trifluralin	60% DF, 500 g/L EC, 10% G	AgrEvo
Roundup Dry	glyphosate	68.5% DG	Monsanto
Roundup FastForward	glyphosate + glufosinate ammonium	400 g/L + 16 g/L SN	Monsanto
Roundup Original	glyphosate	356 g/L SN	Monsanto
Roundup Renew	glyphosate	65% WSG	Monsanto
Roundup Transorb	glyphosate	360 g/L SN	Monsanto
Rustler	glyphosate + dicamba	132 g/L + 60 g/L SN	Monsanto
Select	clethodim	240 g/L EC	Rhone Poulenc
Sencor	metribuzin	75% DF, 75% DG, 500 g/L F	Bayer
Simazine	simazine	80% WP, 474 g/L F	UAP
Stampede EDF	propanil	80% DF	Rohm & Haas
Sundance	sulfosulfuron	75% DG	Monsanto
Target	dicamba + mecoprop + MCPA A	62.5 g/L + 62.5 g/L + 275 g/L SN	Novartis
Thumper	bromoxynil + 2,4-D E	280 g/L + 280 g/L EC	Rhone Poulenc
Touchdown	glyphosate	330 g/L SN, 440 g/L SN	Zeneca
Treflan	trifluralin	480 g/L EC, 5% G	Dow AgroSciences
Triumph Plus	fenoxaprop-p-ethyl + MCPA E + thifensulfuron methyl	56 g/L EC + 256 g/L EC + 75% DF	AgrEvo
Tropotox Plus	MCPB + MCPA A	400 g/L SN	Nufarm
Turboprop	dichlorprop + 2,4-D E	300 g/L + 282 g/L EC	UAP
Unity	bromoxynil + triasulfuron	280 g/L EC + 75% WG	Rhone Poulenc
Vantage	glyphosate	356 g/L SN	Dow AgroSciences
Vantage Plus	glyphosate	360 g/L SN	Dow AgroSciences
Velpar DF	hexazinone	75% DF	DuPont
Venture	fluazifop-p-butyl	25% DG	Zeneca
Victor	glyphosate	356 g/L SN	Inter Ag / AgrEvo

Abbreviations

WP	wettable powder
DG	water dispersible granule
WSG	water soluble granule
EC	emulsifiable concentrate
G	granule
WSP	water soluble powder
DF	dry flowable
SN	solution
F	flowable
A	amine
E	ester

Products Available as Prepackaged Tank Mixes

Product Name (Manufacturer)	Component 1 or A	Component 2 or B	Component 3 or C	Crops	Weeds Controlled	Area Treated	Cost per acre
Achieve Extra Gold (Zeneca Agro)	Achieve 40DG	Buctril M	Turbocharge (adjuvant)	Spring Wheat (including Durum), winter wheat, barley, rye (fall & spring), forage grasses	See the weeds of the component products with the addition of tame buckwheat	20 acres or 8 ha	$22.35
Champion Extra (DuPont Canada Inc.)	Refine Extra	Puma Super		Barley	See component products	40 acres or 16 ha	$20.95
FlaxMax Ultra (BASF Canada Inc.)	Curtail F[1]	Poast Ultra	Merge (adjuvant)	Flax	See component products	18-23 acres or 7.2-9.3 ha	$19.92 to $26.90
Harmony Total (DuPont Canada Inc.)	Refine Extra	Horizon	Score (adjuvant)	Spring wheat (including durum)	Weeds controlled by Refine Extra plus wild oat, green foxtail	40 acres or 16 ha	$20.75
Muster Gold / MusterGold II (DuPont Canada Inc.)	Muster	Assure / Assure II	Sure-Mix (adjuvant)	Canola, including herbicide tolerant canola	See component products	20 acres or 8 ha	$18.95
Pea Pack (Bayer Inc.)	Sencor	MCPA sodium salt		Pea	Lamb's-quarters, stinkweed, wild mustard, redroot pigweed, volunteer canola (non TTC)	40 acres or 16 ha	$7.95
Platinum (Rhone-Poulenc Canada Inc.)	Buctril M	Horizon	Score (adjuvant)	Spring wheat (including durum)	Weeds controlled by Buctril M plus wild oat.	20 acres or 8 ha	$21.70
Prevail (Dow Agroscience)	Achieve 80DG	Curtail M	Turbocharge (adjuvant)	Spring wheat (including durum), barley	Grasses - Wild oat, green foxtail, persian darnel Broadleaves - weeds controlled by Curtail M, with the exception of Russian pigweed and the addition of common groundsel and Russian thistle	20 acres or 8 ha	$26.40
Puma OnePass (AgrEvo)	Buctril M	Puma Super		Spring wheat	See component products	20 acre or 8 ha	$21.50
Unity (Rhone Poulenc Canada Inc.)	Amber	Pardner		Spring Wheat (including Durum) and barley. *For use in the brown and dark brown soils of Saskatchewan only.*	Green smartweed, lady's-thumb, chickweed, cleavers, cow cockle, flixweed, hemp-nettle, kochia, lamb's quarters, redroot pigweed, shepherd's-purse, stinkweed, volunteer canola, wild buckwheat, wild mustard	40 acres or 16 ha	$6.90

[1] *Not recommended for use on flax by itself.*

Note: *See the component products listed for information concerning staging, application information, safety precautions, the effect of weather and grazing, recropping, havest interval and storage precautions. The more stringent recommendation of the two products should be followed. Mix products in the order listed.*

Herbicide Directory

2,4-D

Herbicide Group – 4
(Refer to page 16)

Company:

Various. Application details may differ with different product labels. Consult specific product labels for more information.

Formulations:

500 g/L or 600 g/L 2,4-D amine formulated as a solution; 600 g/L, or 700 g/L 2,4-DLV ester formulated as an emulsifiable concentrate.

Container sizes - various.

Crops:

Wheat, barley, spring and fall rye, winter wheat, field corn, established grass pastures, turf, fall stubble, seedling and established forage grasses (not for seed, amine formulations only).

Note: Not all 2,4-D products are registered for use on forage grasses; any such use of non-registered products is entirely at the risk of the user.

Weeds:

Susceptible weeds controlled in cereals include:

Bluebur
Cocklebur
Flixweed[2]
Kochia
Lamb's-quarters
Mustards including all varieties of volunteer canola
Narrow-leaved hawk's beard[2]
Prickly lettuce
Ragweed
Russian pigweed
Shepherd's purse[2]
Stinkweed[2]

Harder to kill weeds in cereals include:

Blue lettuce[1]
Canada thistle[1]
Common peppergrass
Curled dock
Dandelions[2]
Dog mustard
Leafy spurge[1]
Prostrate pigweed
Redroot pigweed
Russian thistle
Sow thistle[1]

[1] Top growth control only.
[2] Spring seedlings.

Crop Stage:

CROP	STAGE
Wheat, barley, spring rye	4 leaf to early flag leaf
Fall rye, winter wheat	In spring, apply after the crop starts to grow but before the flag leaf stage. Winter wheat only may be treated in the fall for winter annual weed control (**caution: this is not a registered treatment, any such use is at the risk of the user**).
Corn	Apply as an overall spray before corn is 6 inches (15 cm) tall and before the 6 leaf stage. After 6 inches (15 cm) use a directed spray.
Established grass pastures	No restrictions, apply when weeds are actively growing. For control of brush species, apply at time of rapid growth (usually May to mid-June, and September).
Turf	Apply in spring and early September on established turf. Do not use on bent grasses.
Fall stubble	Canada thistle (suppression only) - Apply when thistle plants are actively growing and have 6 to 8 inches (15 to 20 cm) of new growth. Regrowth will be present the following spring and in-crop treatments will be required. Winter Annuals - Apply in late fall when in the rosette stage.
Seedling and established forage grasses (not for seed)	Apply at the 3 leaf to shot blade stage of seedling grasses. Apply in spring up to the shot blade stage of established grasses, or in the fall after harvest.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 4 leaf stage.

Canada thistle (fall stubble) when plants are actively growing and have 6 to 8 inches (15 to 20 cm) of new growth.

Winter annual weeds - apply in late fall when in the rosette stage.

Cost:

Amine 500 g/L - $4.55 per L
Amine 600 g/L - $5.45 per L
LV Ester 600 g/L - $5.92 per L
LV Ester 700 g/L - $6.95 per L
(1999 suggested retail price) Prices may vary depending on supplier.

Rates:

The following rates are for 500 g/L formulations of 2,4-D unless otherwise specified. To convert rates to 600 g/L formulation multiply by 0.83. To convert to 700 g/L formulations multiply by 0.71.

Spring wheat, barley, and rye - For susceptible weeds, apply 0.28 to 0.45 L/acre. For harder to kill weeds, apply 0.51 L/acre to 0.71 L/acre. **Caution** - these higher rates for harder to kill weeds may cause crop injury.

Winter wheat, fall rye - For susceptible weeds, apply 0.28 to 0.40 L/acre. For harder to kill weeds, apply 0.40 L/acre. **Caution** - rates above 0.40 L/acre may cause crop injury.

Corn - 0.28 to 0.45 L/acre.

Pastures - 0.57 to 1.82 L/acre.

Seedling forage grasses - Apply up to 0.45 L/acre of 2,4-D amine.

Established forage grasses - Apply up to 0.90 L/acre of 2,4-D amine or 0.78 L/acre of 2,4-D Ester 600 (600 g/L formulations) or 0.67 L/acre of 2,4-D Ester 700 (700 g/L formulations).

Fall stubble (Canada thistle, suppression only) - 0.91 L/acre.

Fall stubble (winter annuals) - 0.28 to 0.45 L/acre.

Formulation Characteristics:

Formulation	Risk of Vapour Drift	Activity on Weeds	Risk of Crop Injury
LV Ester	Medium	Fast	Medium
Amine	Very Low	Medium	Low

Water Volume:

10 gallons/acre (45 L/acre) - ground application.

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

2,4-D is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Best weed control occurs when temperatures are above 21°C and humidity is above 70 percent. Do not apply if temperature exceeds 27°C.

Herbicide Tank Mixes:

Crop	2,4-D Amine	2,4-D Ester
Spring Wheat	Accord, Ally, Banvel II, Express, Horizon, Lontrel, Pardner, Refine Extra, Sencor, Stampede EDF.	Accord, Achieve, Ally, Assert, Avenge, Express, Lontrel, Pardner, Puma, Refine Extra, Assert + Refine Extra, Stampede EDF, Sundance.
Winter wheat	Banvel II, Express, Lontrel, Pardner, Refine Extra, Sencor.	Achieve, Assert, Avenge, Express, Lontrel, Pardner, Refine Extra, Assert + Refine Extra.
Barley	Ally, Banvel II, Express, Lontrel, Pardner, Refine Extra, Sencor.	Achieve, Assert, Ally, Avenge, Express, Lontrel, Pardner, Refine Extra, Assert + Refine Extra.
Summer fallow	Glyphosate	

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: 2,4-D amine - within 4 hours will reduce control.

2,4-DLV ester - within 2 hours will reduce control.

Grazing: Do not permit lactating dairy animals to graze fields within 7 days of application. Do not harvest forage or cut for hay within 30 days of application. Withdraw meat animals from treated fields at least 3 days before slaughter.

Recropping: No restrictions the year after treatment.

Aerial Application: Some formulations may be applied by air. Check the label for detailed instructions.

Storage: 2,4-D LV ester may be frozen. 2,4-D amine requires heated storage.

Tank Cleaning:

When finished spraying 2,4-D, run clean water through the tank, pump and lines. Drain. Refill sprayer with clean water and 1 L of household ammonia per 100 L of water. Circulate the solution through lines and nozzles. Flush sprayer system with water until thoroughly clean. Remove and clean nozzles and screens.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

2,4-DB

Herbicide Group – 4

(Refer to page 16)

Company/Products:

Interprovincial Co-op (Cobutox 600)
Nufarm (Embutox 625)
United Agri Products (Caliber 400)

Formulations:

Cobutox 600 - 600 g/L 2,4-DB formulated as an emulsifiable concentrate.
Container size - 10 L.

Embutox 625 - 625 g/L 2,4-DB formulated as an emulsifiable concentrate.
Container size - 10 L.

Caliber 400 - 400 g/L 2,4-DB formulated as an emulsifiable concentrate.
Container size - 10 L.

Crops:

Seedling stands of alfalfa, bird's-foot trefoil, and white Dutch clover. May be used on these forage legumes sown alone or with wheat, barley or oats as a cover crop. May be used on pastures.

Embutox and Calibre only: Seedling timothy, smooth bromegrass, orchard grass, fescue (creeping red, meadow, tall), wheatgrass (crested, intermediate, streambank, tall).

Weeds:

Weeds controlled at lower recommended rates include:

Ball mustard
Lamb's-quarters
Ragweed
Redroot pigweed
Shepherd's-purse
Stinkweed
Wild mustard
Wormseed mustard

Weeds controlled at higher recommended rates include:

Bull thistle (top growth control only)
Canada thistle (top growth control only)
Chicory
Curled dock (suppression)
Dandelion (top growth control only)
Field bindweed
Green smartweed (suppression)
Horsetail (top growth control only)
Narrow-leaved hawk's beard
Oak-leaved goosefoot
Perennial sow-thistle (top growth control only)
Lady's-thumb (suppression)
Plantain
Wild buckwheat
Yellow rocket

Refer to individual product labels for details on application rates to use for different weed species.

Crop Stage:

Cereals between the 5 leaf and flag leaf stage.

Forage legumes must be between the 1 and 3 trifoliate leaf stage.

Pastures containing forage legumes - apply after cutting or grazing when growth is not more than 3 inches (7.5 cm) in height.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 4 leaf stage of annual weeds. 2 to 4 leaf stage for narrow-leaved hawk's beard control, apply in the fall after legume growth ceases.

Perennial sow-thistle, bull thistle - rosette stage.

Canada thistle - 15 cm (6 inches) to early bud stage.

Plantain - spray before flowering.

Yellow rocket - third week of September to the middle of October.

Horsetail - 10 to 13 cm (4 to 5 inches) in height.

Dandelion - before bud stage.

Cost:

$13.63 to $17.47/acre (1999 suggested retail price).

Rates:

When applying to seedling forage legumes:

HERBICIDE	RATE (L/ACRE)	ACRES TREATED PER CONTAINER
Cobutox 600	0.73 - 0.93	13.7 - 10.8
Embutox 625	0.71 - 0.91	14.1 - 11.0
Caliber 400	1.1 - 1.4	9.0 - 7.0

When applying to pastures containing forage legumes:

HERBICIDE	RATE (L/ACRE)	ACRES TREATED PER CONTAINER
Cobutox 600	0.73 - 1.13	13.7 - 8.8
Embutox 625	0.71 - 1.11	14.1 - 9.0
Caliber 400	1.11 - 1.72	9.0 - 5.8

Water Volume:

15 to 20 gallons/acre (70 to 90 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

2,4-DB is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Severe damage to legumes can occur if high temperatures (more than 27°C) or high humidity prevail at the time of application.

Do not apply under dry soil/drought conditions.

Tank Mixes:

Herbicides: To improve control of wild mustard beyond the 4 leaf stage, Cobutox at the reduced rate of 0.53 L/acre, or Caliber 400 at 0.81 L/acre, may be tank mixed with MCPA amine (500 g/L) at 0.028 L/acre. Embutox 625 at 0.51 L/acre may be tank mixed with MCPA sodium salt (300 g/L) at 0.047 L/acre. This tank mix may increase crop damage (stunting). Follow all precautions and restrictions on both product labels. May be tank mixed with Venture for use in alfalfa.

Embutox 625 and Cobutox may be tank mixed with Avenge in barley and certain wheat varieties. See Avenge label for wheat restrictions.

Fertilizers: None.

Insecticides: None.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour will reduce control.

Grazing: Do not graze or cut for feed for 30 days after applying Embutox. Do not graze treated crop or cut for feed in year of treatment after using Cobutox or Caliber.

Recropping: No restrictions the year after application.

Aerial Application: No restriction on label. Reduced water volumes used with aerial applications will lead to increased injury to forage legumes.

Storage: Do not freeze Caliber 400.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled broadleaf crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Poison (Cobutox 600)

Caution Poison (Embutox 625)

Warning Poison (Caliber 400)

Accent*

Herbicide Group – 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

75 percent nicosulfuron formulated as a water dispersible granule.

Container size - 133.6 g (4 x 33.4 g water soluble bags).

Crops:*

Field Corn

*Since this product is registered under minor use application, the manufacturer assumes no responsibility for herbicide performance.

Crop Stage:

1-8 leaf stage (six visible collars), coleoptile (short, blunt leaf) is counted as the first leaf.

Weeds Controlled and Staging:

1-6 leaves (up to 2 tillers)	Barnyard grass, fall panicum, green foxtail, yellow foxtail[1], old witchgrass
3-6 leaves (4-8 inches (10 to 20 cm) with leaf extended)	Quackgrass
3-6 leaves	Wild oats

[1]suppression only

Cost:

$23.14 per acre.

(1999 suggested retail price)

Rates:

Apply Accent at 0.0135 kg/acre. Add non-ionic surfactant (Cittowet Plus, Agsurf or Agral 90) at 0.2 L per 100 L of spray solution.

One container of Accent will treat 10 acres (4 ha).

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

Minimum 10 gal/acre (45 L/acre); optimum 12.5 to 17 gal/acre (57 to 77 L/acre)

Pressure:

175 to 275 kPa (25 to 40 psi).

Nozzles:

Flat fan nozzles tilted forward at a 45° angle. Screens of 50 mesh or larger are recommended.

How it Works:

Accent is a systemic herbicide that is absorbed through the foliage and translocated to the growing points of the plant. Growth of affected plants will stop shortly after application. Symptoms include discolouration (yellowing, purpling, and reddening) of the newest leaves and are visible within 1 to 3 weeks. Eventually the entire plant discolours and dies.

Effects of Growing Conditions:

Poor weed control or crop injury may result if at the time of application, plants are under stress from disease, insect or nematode injury, carryover of herbicide from a previous years application, abnormally hot or cold weather, drought, water-soaked soils, hail damage or frost. Delay application until stress passes and both corn and weeds have resumed growth. When corn is injured by frost, wait 48-72 hours after normal growing conditions have resumed before applying Accent. Stress conditions after application may also result in injury or poor weed control.

Tank Mixes:

Herbicides: None registered.

Fertilizers: Do not mix with fertilizers.

Insecticides: None registered. Accent should not be applied to corn that has been treated with Counter, Cygard, Thimet, or Di-Syston. Application of Accent to corn treated with Dyfonate may result in temporary yellowing or stunting of crop. Leave seven days between the application of Accent and that of a foliar organophosphorous insecticide.

Restrictions:

Rainfall: Within 2-4 hours of application may result in reduced weed control.

Grazing: Do not graze treated crops or cut for hay.

Preharvest Interval: Do not apply within 30 days of harvest.

Recropping: Corn and spring cereals may be seeded the year following Accent application. For all other crops, a field bioassay is recommended before planting.

Aerial Application: Do not apply by air.

Storage: Store product in original containers in a secure, dry area, away from other pesticides, food or feed.

Buffers: Leave a 5 m buffer between the last spray path and woodlots or shelterbelts. Leave a 22 m buffer before wetland areas or water bodies.

Tank Cleaning:

Drain tank and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for a minimum of 5 minutes. Fill the tank with water while adding 1 litre of household ammonia (minimum 3 percent ammonia) for every 100 L of water. Flush hoses, boom and nozzles with the cleaning solution, then add more water to completely fill the tank. Circulate for 15 minutes. Again flush hoses, boom and nozzles with the cleaning solution, then drain the tank. Remove and clean the nozzles and screens separately in a bucket containing a 1 percent solution of ammonia in water. If the spray equipment is to be used to spray crops other than corn, repeat the above process and thoroughly wash the spray mixture from the outside of the spray tank and the boom. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing the water through the hoses and boom. Prior to using the sprayer again, flush the tank, boom and hoses for 5 minutes with fresh water.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent or walk.

Hazard Rating:

KEEP OUT OF REACH OF CHILDREN.

Caution Eye Irritant

Avoid breathing spray mist.

Avoid contact with skin, eyes and clothing.

Accord

Herbicide Group – 4
(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

75 percent quinclorac formulated as a dry flowable. Container size - 2 x 1.1 kg bags of Accord and 2 x 8.1 L jugs of Merge.

Crops:

Spring wheat (including durum), canaryseed*, feed barley** (not for use on malting barley).

* Not to be used for human consumption or livestock feed.

** At the time of publishing, a restriction on barley treated with Accord from entering the USA is in place. Check with BASF and your potential buyers before using Accord on barley destined for the USA.

Weeds:

Green foxtail, barnyard grass, cleavers, volunteer flax.

Crop Stage:

Wheat - 1 to 5 leaf.

Canaryseed - 3 to 5 leaf

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Green foxtail - 1 to 5 leaf, maximum 2 tillers.

Barnyard grass - 1 to 5 leaf.

Cleavers - 1 to 3 whorls.

Volunteer flax - 1 to 8 cm (0.5 to 3 inches).

Early treatment of weeds is important to maximize crop yield potential by eliminating early weed competition. Refer to page or label of broadleaf tank mix partner for additional timing restrictions.

Cost:

$8.65 to $10.48/acre (1999 suggested retail price).

Rate:
0.054 to 0.068 kg/acre (40 to 33 acres/case). Apply with Merge at 1 L per 100 L of spray solution. Use the high rate for heavy infestations of green foxtail. Guidelines for weed densities at light or heavy infestations are not provided on the product label. When in doubt as to the infestation level, use the high rate or contact your local BASF technical representative.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:
10 gallons/acre (45 L/acre).

Pressure:
275 kPa (40 psi).

Nozzles:
Standard flat fan nozzles tilted forward 45 degrees. Use 50 mesh strainers and screens.

How it Works:
Accord is a systemic, growth regulator type herbicide that is absorbed primarily through the foliage, but also through the roots of plants. New leaves of susceptible grassy weeds become chlorotic (yellowed) within 1 to 2 weeks of application and eventually turn brown, resulting in plant death 2 to 4 weeks after application. Accord causes epinasty (bending and twisting) in broadleaf weeds 1 to 2 weeks after application, with plant death occurring 2 to 4 weeks after application.

Effects of Growing Conditions:
Do not apply to crop that is under stress from conditions such as frost, hail, flooding, drought or extremes in temperature.

Tank Mixes:
Herbicides: Accord may be mixed with the following herbicides. When mixing with broadleaf partners a slight reduction in green foxtail control may result. If spraying for green foxtail, use the high rate of Accord.

Buctril M (0.40 L/acre)

2,4-D amine or ester - 500 g/L formulations (0.34 to 0.45 L/acre)

MCPA amine or ester - 500 g/L formulations (0.34 to 0.45 L/acre)

Refine Extra (0.008 kg/acre)

Express Pack (0.004 kg/acre Express + 0.253 L/acre 2,4-D ester)

Avenge 200 C (1.42 L/acre) - Apply to spring wheat varieties listed on Avenge 200C label only. The Accord/Avenge 200 C tank mix can also be mixed with Buctril M, 2,4-D ester, MCPA ester or Refine Extra at the rates listed above.

To improve green foxtail control use the high rate of Accord. Add Merge at 1 L per 100 L spray solution for all tank mixes. Refer to individual product labels for application details such as staging and varietal restrictions.

Fertilizers: None registered.

Insecticides: None registered.

Allow 4 days between the application of Accord and any other chemical not listed as a tank mix.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:
Rainfall: Within 6 hours may reduce control.

Grazing: Do not graze or cut for feed within 77 days of application.

Preharvest: Do not apply within 77 days of harvest.

Recropping: Wheat, barley, canola, field peas and sunflowers may be grown the year after application. Flax and lentils may be grown the second year after an Accord application. On low organic matter soils or under dry conditions, flax and lentils should not be grown until the third year after application. Do not use Accord on land where potatoes or vegetables are grown. In case of crop failure, only spring wheat (including durum) may be reseeded the same year as an Accord application. The company recommends that a field bioassay (a test strip grown to maturity) be conducted the year before growing any crops other than those listed above.

Aerial Application: Do not apply by air.

Storage: May be frozen. Should product freeze, warm to room temperature before using.

Tank Cleaning:
Completely fill spray tank with clean water while adding 1 L of household ammonia (containing 3 percent ammonia) per 100 L of water or a commercially licensed tank cleaner such as Finnish. Flush the solution through the boom and nozzles and then add more water to completely refill the tank. Agitate the solution for at least 15 minutes and then flush the boom and nozzles until the spray tank is empty.

Hazard Rating:
Caution Poison

Caution Eye and Skin Irritant

Achieve 80 DG

Herbicide Group – 1
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

Achieve 80 DG – 80 percent tralkoxydim formulated as a dispersible grain. Container size - 2 x 2 kg plus 8 L of Turbocharge adjuvant.

Crops:

Cereal crops:
Spring wheat (including durum), winter wheat, barley, triticale, rye (spring and fall)

Forage grasses for seed production only (seedling or established):
Intermediate wheatgrass
Crested wheatgrass
Creeping red fescue
Meadow bromegrass
Smooth bromegrass

Forage grasses (seedling year only):
Northern wheatgrass
Western wheatgrass
Slender wheatgrass

Forages grasses (established only):
Timothy

May be used on wheat and barley crops undersown to forage legumes (if not tank mixed with a broadleaf herbicide).

Weeds:

Wild oats
Green foxtail
Yellow foxtail
Barnyard grass
Persian darnel
Volunteer oats

Crop Stage:

Timothy - 5 to 6 leaf stage. Applications before this stage will result in crop injury and reduction in forage yield.

Other crops - No restrictions in terms of leaf staging.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Wild oats - 1 to 6 leaf stage (total leaves including tillers), with a maximum of 2 tillers.

Volunteer tame oats - 1 to 6 leaf stage.

Green foxtail - 1 to 5 leaf stage (total leaves including tillers), with a maximum of 1 tiller.

Persian darnel, barnyard grass - 1 to 4 leaf stage (total leaves including tillers).

Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Cost:

$16.20/acre (1999 suggested retail price).

Rates:

Achieve 80 DG – 0.10 kg/acre. (One case treats 40 acres). Add Turbocharge at a rate of 0.5 L per 100 L spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre). Use 10 gallons/acre (45 L/acre) when applying to timothy. Do not apply with air assist sprayers set to apply less than 5 gallons/acre (23 L/acre) water volume as mixing problems or unacceptable crop injury could occur.

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan nozzles. All strainer and nozzle screens must be 50 mesh or coarser.

How it Works:

Achieve is a systemic herbicide that is absorbed through leaves and translocated to growing points within plants. Early symptoms appear in 3 to 7 days as chlorosis (yellowing) on the newest leaves, which spreads to older leaves, leading to browning and plant death 2 to 3 weeks after application.

Effects of Growing Conditions:

Cereal crops that have set tillers may incur injury (yellowing and/or stunting) if applications are made within 48 hours of freezing temperatures. Cereal crops that have not set tillers may be injured if exposed to temperatures of 4°C or less up to 48 hours before or after application. Tank mixing with a broadleaf weed herbicide under adverse conditions may increase severity of crop injury. Crops under stress from foliar diseases or low fertility are more susceptible to injury from application. Temporary crop injury may occur when Achieve tank mixes (particularly Estaprop, Turboprop, Dichlorprop D, and Buctril M + MCPA) are applied under extreme environmental conditions (dry or wet, cool or hot weather) resulting in crop stress. Control of grasses could be reduced when they are stressed due to drought, heat, lack of fertility, flooding or prolonged cool temperatures.

Tank Mixes:

Herbicides: In wheat and barley, Achieve may be tank mixed with:
2,4-DB (0.81 L/acre - 600 g/L formulations)
2,4-D ester (0.45 L/acre - 500 g/L formulations)
Attain (40 acres per case)
Buctril M (0.40 L/acre)
Curtail M (0.80 L/acre)
Dichlorprop + 2,4-D (0.71 L/acre)
Lontrel + MCPA ester (0.20 L/acre + 0.45 L/acre - 500 g/L formulations)
MCPA ester (0.45 L/acre - 500 g/L formulations)
Pardner (0.40 L/acre)
Prestige (20 acres per case)
Thumper (0.40 L/acre)

Tank mixes with Buctril M, Thumper, or Pardner may result in some temporary initial injury in the form of tip burn. Temporary crop injury and a reduction in wild oat control may occur with the Attain tank mix.

For all tank mixes with Achieve, add Turbocharge at a rate of 0.5 L per 100 L of spray solution.

When applying broadleaf herbicides not listed above, in the same field, always apply Achieve first. Apply the broadleaf product no sooner than seven days after application of Achieve.

Fertilizers: None registered.

Insecticides: Achieve, Achieve + Buctril M, and Achieve + Pardner may be mixed with Decis Flowable at 0.049 L/acre.

Fungicides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour will reduce control.

Grazing: Timothy and treated cereal crops must not be grazed or cut for feed within 16 days of treatment. Straw from treated crops may be fed to livestock. Treated forage grasses grown for seed production must not be grazed or cut for feed. Do not graze other treated forage crops in the year of treatment (except timothy).

Recropping: None.

Aerial Application: Achieve may be applied by air in 2.5 to 4 gallons/acre (11 to 18 L/acre). Do not apply within 50 m of fish bearing waters and wildlife habitat.

Storage: May be frozen.

Preharvest: Do not apply within 60 days of harvest.

Environment: Do not apply within 15 m of fish bearing waters and wildlife habitat.

Tank Cleaning:

When spraying is complete, thoroughly rinse the tank with clean water to remove any residues. Use of a detergent or Agral 90, Agsurf will enhance removal of any residues in the tank.

Hazard Rating:

Caution Poison
Caution Eye Irritant

Achieve Extra Gold

Herbicide Group – 1,4,6
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

Achieve Extra Gold contains 3 components.

Achieve 40 DG - 40 percent tralkoxydim formulated as a dispersible granule. Container size - 4 kg.

Buctril M - 280 g/L bromoxynil and 280 g/L MCPA ester formulated as an emulsifiable concentrate. Container size - 8 L.

Turbocharge adjuvant. Container size - 4 L.

Crops:

Cereal crops:
Spring wheat (including durum), winter wheat, barley, triticale, rye (spring and fall)

Crop Stage:

Spring wheat, barley - 2 leaf to early flag leaf stage.

Winter wheat, fall rye - from the time growth commences in the spring to the early flag leaf stage.

Weeds Controlled and Weed Stage:

Grassy weeds controlled include:

Wild oats (1 to 6 leaf stage, total leaves including tillers with a maximum of 2 tillers)

Barnyard grass, Persian darnel (1 to 4 leaf stage, total leaves including tillers)

Green foxtail, yellow foxtail (1 to 5 leaf stage, total leaves including tillers with a maximum of 1 tiller)

Volunteer tame oats (1 to 6 leaf stage).

Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are controlled before tillering.

Broadleaf weeds controlled include:

Up to the 4 leaf stage -
American nightshade
Ball mustard
Bluebur
Cocklebur
Cow cockle
Flixweed
Green smartweed
Kochia[1]

Up to the 6 leaf stage -
Wild tomato

Up to the 8 leaf stage -
Common groundsel
Common ragweed
Lamb's-quarters
Stinkweed
Tartary buckwheat

Up to the 4 leaf stage -
Lady's-thumb
Night-flowering catchfly
Pale smartweed
Redroot pigweed
Russian thistle[1]
Scentless chamomile
(spring annuals only)
Shepherd's-purse
Velvetleaf[2]
Volunteer canola
Volunteer sunflower

Up to the 8 leaf stage -
Volunteer tame buckwheat
Wild buckwheat
Wild mustard
Wormseed mustard

Perennials - top growth checked
Canada thistle
Perennial sow-thistle

[1] Spray before plants are 5 cm (2 inches) in height.
[2] Spray before plants are 8 cm (3 inches) in height.

Cost:

$22.35/acre (1999 suggested retail price).

Rate:

One case treats 20 acres. Add Turbocharge at a rate of 0.5 L per 100 L spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre). Do not apply with air assist sprayers set to apply less than 5 gallons/acre (23 L/acre) water volume as mixing problems or unacceptable crop injury could occur.

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° degree flat fan nozzles. All strainer and nozzles screens must be 50 mesh or coarser.

How it Works:

Achieve is a systemic herbicide that is absorbed through leaves and translocated to growing points within plants. Early symptoms on grassy weeds appear in 3 to 7 days as chlorosis (yellowing) on the newest leaves, which spreads to older leaves, leading to browning and plant death 2 to 3 weeks after application. Buctril M contains two components, bromoxynil and MCPA ester. Bromoxynil is a contact herbicide causing yellowing on susceptible weeds within 1 or 2 days and browning 3 to 6 days after application. MCPA ester is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Cereal crops that have set tillers may incur injury (yellowing and/or stunting) if applications are made within 48 hours of freezing temperatures. Cereal crops that have not set tillers may be injured if exposed to temperatures of 4°C or less up to 48 hours before or after application. Tank mixing with a broadleaf weed herbicide under adverse conditions may increase severity of crop injury. Crops under stress from foliar diseases or low fertility are more susceptible to injury from application. Temporary crop injury may occur when Achieve Extra Gold is applied under extreme environmental conditions (dry or wet, cool or hot weather) resulting in crop stress. Control of grasses could be reduced when they are stressed due to drought, heat, lack of fertility, flooding or prolonged cool temperatures.

Tank Mixes:

Herbicides: May be tank mixed with 0.22 L/acre MCPA ester (500 g/L formulations). A reduction in green foxtail control may occur with this tank mix.

Fertilizers: None registered.

Insecticides: May be tank mixed with 0.049 L/acre Decis Flowable.

Fungicides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour will reduce control.

Grazing: Do not graze treated crops or cut for feed within 30 days of application.

Recropping: No restrictions.

Aerial application: Achieve Extra Gold may be applied by air in 2.5 to 4 gallons/acre (11 to 18 L/acre) water.

Storage: May be frozen.

Preharvest: Do not apply within 60 days of harvest.

Environment: Do not apply within 15 m of fish bearing waters and wildlife habitat.

Tank Cleaning:

When spraying is complete, thoroughly rinse the tank with clean water to remove any residues. Use of a detergent or Agral 90, Agsurf will enhance removal of any residues in the tank.

Hazard Rating:

Caution Poison, Caution Eye Irritant (Achieve 40 DG)
Warning Poison (Buctril M)

Ally Toss-N-Go

Herbicide Group – 2
(Refer to page 16)

Company:
DuPont Canada Inc.

Formulation:
60 percent metsulfuron methyl formulated as a dry flowable.

Container size - 122 g (4 x 30.5 g water soluble bags).

Crops:
Ally - wheat (spring and durum), barley, seedling or established creeping red fescue for seed*, orchard grass*, crested wheatgrass* and intermediate wheatgrass (for forage or seed production*).

* Since applications in these crops have been registered under minor use application, the manufacturer assumes no responsibility for herbicide performance.

Weeds:
Weeds Controlled:

Ball Mustard
Bluebur
Chickweed
Common groundsel
Corn spurry
Cow cockle
Flixweed
Green smartweed
Hemp-nettle
Kochia
Lady's-thumb
Prostrate pigweed
Redroot pigweed
Scentless chamomile
Shepherd's-purse
Stinkweed
Stork's-bill
Tartary buckwheat
Volunteer canola[1]
Wild mustard

[1] Smart canola varieties will be controlled only with the addition of 2,4-D or MCPA.

Weeds Suppressed:

Canada thistle
Lamb's-quarters
Russian thistle
Sow-thistle (annual and perennial)
Toadflax
Wild buckwheat

Caution:
Ally residues can persist for long periods, potentially limiting recropping options. Degradation of Ally is dependent on the pH, moisture, and temperature of the soil. Refer to the label for details on rotation and minimum recropping intervals.

Crop Stage:
Wheat, barley - 2 leaf to flag leaf stage.

Forage grasses - 2 leaf to flag leaf. Apply before canopy is dense enough to prevent thorough leaf coverage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:
2 to 4 leaf stage. Wild buckwheat must be sprayed in the cotyledon to 3 leaf stage. For suppression of Canada thistle, apply when thistles are less than 6 inches (15 cm) tall.

Cost:
$3.53 to $5.30/acre (1999 suggested retail price).

Rates:
Apply 0.002 to 0.003 kg/acre. Add Agral 90, Agsurf, Companion, Super Spreader Sticker or Citowett Plus at 0.2 L per 100 L spray volume. (One 122 g container of Ally treats 40 to 60 acres.)

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:
10 gallons/acre (45 L/acre).

Pressure:
200 to 275 kPa (35 to 40 psi).

Nozzles:
Flat fan nozzles. Use 50-mesh screens.

How it Works:
Ally is absorbed by leaves and roots, and rapidly stops growth of susceptible weeds. Discoloration will be visible in 1 to 3 weeks.

Effects of Growing Conditions:
Ally may injure crops stressed by heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperatures, drought, or water-saturated soils, either before or after application. Weed control will be reduced under dry, cold conditions.

Tank Mixes:

Herbicides: Do not mix the soluble bags with any substance containing boron or which releases chlorine.

The following products can be tank mixed with Ally for control of weeds in wheat and barley:

2,4-D Amine or Ester (0.34 to 0.45 L/acre of 500 g/L formulation), plus surfactant.
MCPA Amine or Ester (0.28 to 0.45 L/acre of 500 g/L formulation), plus surfactant.
Avenge (1.72 L/acre), no surfactant required.
Avenge + MCPA Ester, no surfactant required.

In spring wheat (including durum), Ally may be tank mixed with:
Horizon (0.095 or 0.115 L/acre) plus Score adjuvant
Puma Super (0.202 or 0.405 L/acre) with no surfactant

Consult tank mix partner labels for additional crop staging restrictions.

Fertilizer: None registered. Do not mix the soluble bags with fertilizers.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 4 hours of application of tank mixes with 2,4-D amine, 2 hours of application of tank mixes with 2,4-D ester, will reduce weed control.

Grazing: Do not graze for 24 hours after treatment.

Recropping: Refer to table below. The following recropping intervals, based on soil pH, should be considered as guidelines only. Ally residues may affect crops for a longer period of time than outlined in the following table. Add 12 months to recommendations if less than 5 inches (130 mm) of rainfall in brown and dark soils or less than 10 inches (250 mm) rainfall in black or grey wooded soils in any year following application.

Effects of Ally residues on crops other than those listed in the table have not been fully evaluated. Because of the length of recropping restrictions and the lack of information on many rotational crops, Ally is not recommended for use on farms where special crops are grown (such as fababeans, beans, sunflowers, buckwheat, corn, sugar beets, etc.).

Aerial Application: Do not apply by air.

Storage: Store in a cool, dry place. May be frozen.

Tank Cleaning:

Ally can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Ally should be flushed out immediately after Ally is used. The manufacturer recommends that sprayers used to apply this product be flushed 2 times with a water/household ammonia rinse (1 L of 3 percent ammonia per 100 L water). All nozzles, screens and filters should be removed and cleaned after applying this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison
Caution Eye Irritant

MINIMUM RECROPPING INTERVAL (MONTHS)

SOIL PH	BARLEY, WHEAT	OAT[1]	CANOLA[1]	FLAX[1]	LENTILS	CANARY-SEED	YELLOW MUSTARD
less than 7.0	10	10	10 (22)	10 (22)	34	48	48
7.0 - 7.9	10	10 (22)	22 (34)	34	48	48	48

[1] Figures in brackets refer to recropping intervals in brown and dark brown soil zones. ALL OTHER DATA refer to recropping intervals in all soil zones.

On black and grey wooded soils with pH of 7.5 or less, fescue may be planted 10 months after application and alfalfa, red clover, peas and flax may be planted 22 months after application. Do not use on soils with pH greater than 7.9.

Amber (Not for use in Manitoba)

Herbicide Group – 2
(Refer to page 16)

Company:

Novartis Crop Protection

Formulation:

75 percent triasulfuron formulated as a water dispersible granular. Each carton contains 10 x 54 g water soluble bags and treats 40 to 50 acres (net carton weight - 540 g).

Crops:

Spring wheat (excluding durum). For use in the brown and dark brown soil zones of Saskatchewan and Alberta only.

Weeds:

Weeds controlled at 0.011 kg/acre (1 carton/50 acres):

Common peppergrass
Cow cockle
Flixweed
Redroot pigweed
Stinkweed
Lamb's-quarters (suppression only)

Weeds controlled at 0.013 kg/acre (1 carton/40 acres) in addition to weeds above:

Kochia
Russian thistle
Wild buckwheat

Caution:

Amber is recommended for long-term spring wheat production systems in the brown and dark brown soil zones of Saskatchewan and Alberta only. Residues of Amber can persist for several years, potentially limiting cropping opportunities. The degradation of Amber in the soil is affected by rainfall, soil temperature and soil pH. If you are considering using this product, be sure to read the recropping restrictions outlined in the product label.

Crop Stage:

Pre-emergence. Apply Amber in the fall during September and October prior to freeze-up, or as early as possible in April or May, prior to weed germination and crop seeding. A fall application is preferred due to increased probability of adequate moisture for incorporation and activation of Amber.

Weed Stage:

Pre-emergence. Use the high rate plus a recommended surfactant if weeds have emerged, and are not expected to be controlled by the seeding operation.

Cost:

$3.95 to $4.94 per acre (1999 suggested retail price).

Rates:

0.011 to 0.013 kg/acre. If required, add a recommended non-ionic surfactant such as Citowett Plus, Agsurf, Agral 90, Agsurf, Super Spreader Sticker or Companion at 0.25 L per 100 L spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan. 50 mesh screens or coarser.

Application:

Amber is not tied up by plant residues, however excessive trash cover at the time of application can intercept the herbicide and prevent it from reaching the soil surface. If Amber is to be used in such cases, trash should be incorporated.

Incorporation:

If rainfall has not occurred since spring application, mechanical incorporation will be required. Tillage operations deeper than 2 inches after application will dilute Amber and can result in reduced control. If seeding with a press drill, ensure that Amber is applied prior to seedbed preparation (one pass recommended, 1.25 to 2 inches deep). If seeding using zero till equipment, ensure that Amber is applied in the fall or very early in the spring to allow sufficient moisture to adequately move the product into the weed germination zone.

How it Works:

Amber is rapidly translocated to the growing points of roots and shoots, where growth is inhibited. Susceptible weeds stop growing soon after germination, turn yellow or purple and die, usually before emerging.

Effects of Growing Conditions:

For spring application, moisture is required for incorporation and activation of Amber prior to weed germination. Best results are obtained when rainfall occurs following application and prior to weed germination. The earlier the application, the more likely these conditions will prevail. If rainfall has not occurred since spring application, mechanical incorporation is required (See Incorporation section in this guide or product label).

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Rainfall is required to incorporate Amber into the weed germination zone.

Grazing: Do not graze livestock on treated crops and do not feed straw from treated crops to livestock.

Recropping: Crops other than spring wheat have shown a high sensitivity to low residues of Amber in the soil. The risk of injury to rotational crops is affected by a number of factors, including soil factors (soil type and soil pH), environmental factors (soil temperature, precipitation), crop species, and recropping interval. Breakdown in soil of Amber is more rapid with conditions of high moisture, high temperature, and low pH.

To avoid injury to subsequent crops after an application of recommended rates of Amber, the following recropping intervals should be observed:

Land previously treated with Amber cannot be rotated to crops other than those listed until a field bioassay confirms that residues of Amber are not present. A field bioassay involves growing test strips of the crop(s) intended for production the following year in fields previously treated with Amber. Crop response will dictate whether or not to rotate to the crop(s) used in the test strip. See Field Bioassay section of product label.

Do not use Amber more than twice in a 36-month period in the same field.

Aerial application: Do not apply by air.

Storage: Do not freeze.

Environment: Do not contaminate streams, lakes, ponds, wetlands, sloughs, irrigation water or wells. Do not apply to irrigated land. Leave at least a 15 m buffer zone around wildlife habitat. Do not apply to snow covered or frozen soil surfaces, as runoff can occur.

Tank Cleaning:

Amber can cause injury to sensitive crops at low concentrations. Clean sprayer immediately after use. Do not clean near desirable vegetation, wells or other water sources. Drain and flush tank and boom with water and household detergent. Add 1 L household ammonia and 100 L water to spray tank, allow to agitate for 15 min. before flushing through nozzles. Wash nozzles and screens in water/ammonia mix in pail. Rinse system with clean water for 5 minutes.

Hazard Rating:

Keep out of reach of children.

CROP	MINIMAL INTERVAL (MONTHS)	
	pH 7.5 or less	Greater than pH 7.5
Spring Wheat (Hard Red, Canada Prairie, Extra Strong)	No Restrictions	No Restrictions
Barley, oats, durum wheat	10	10
Flax, canaryseed	22	Bioassay
Canola, peas	34	Bioassay
Lentils	46	Bioassay
All other crops	Bioassay	Bioassay

Amitrol 240

Herbicide Group – 11
(Refer to page 16)

Company:

Nufarm

Formulation:

231 g/L amitrole formulated as a liquid. Container size - 10 L.

Crops:

Perennial weed control after harvest.
Non-selective patch treatment of perennial weeds in pastures and shelterbelts. Dandelion and annual weed control prior to planting field corn, soybeans and white beans.

Weeds:

Fall stubble: Canada thistle, sow-thistle.

Pastures, shelterbelts: non-selective control of Canada thistle, sow-thistle, dandelion, milkweed, toadflax, poison ivy, leafy spurge, hoary cress, horsetail.

Preseeding (field corn, soybeans and white beans only): dandelion and annual weeds.

Crop Stage:

Cereals, peas: After harvest in fall.

Shelterbelt: Use only in established shelterbelts. Direct spray away from tree foliage or trunks.

Pastures: Time applications according to weed stage.

Preseeding (field corn, soybeans and white beans only): Delay planting for 10 to 14 days after treatment for field corn and white beans; 6 days for soybeans.

Weed Stage:

Fall stubble: Spray when thistle has 4 to 6 inches (10 to 15 cm) of new growth.

Do not cultivate for 2 weeks after application. Do not apply after October 1. Do not replant crops in treated areas within 8 months of application.

Pastures and Shelterbelts:

WEED	WEED STAGE
Canada thistle, perennial sow-thistle	Early bud to bloom stage
Dandelion	Plants, young, actively growing
Toadflax	Advanced rosette to prebud
Hoary cress	Advanced rosette or advanced bud
Leafy spurge	Advanced flowering to early seed set
Milkweed, horsetail, and poison ivy	When plants are young and actively growing

Do not mow treated plants for 3 weeks after application.

Preseeding (field corn, soybeans and white beans only): Dandelion should be actively growing and less than 10 cm tall or across. Do not cultivate for 10 to 14 days after treatment.

Cost:

$6.20/L (1999 suggested retail price).

Rates:

WEED	RATE (L/ACRE)
Canada thistle	5.0 to 6.6
Perennial sow-thistle	5.0 to 6.6
Dandelion	1.68 to 3.3
Toadflax	7.5 to 11.2
Milkweed	7.5 to 11.2
Hoary Cress	7.5 to 11.2
Leafy Spurge	15.0 to 18.3
Horsetail	7.5 to 11.2
Cattails	15.0 to 18.3
Poison Ivy	3.37

Avoid using rates higher than 6.6 L/acre for preplant applications on very light textured soils with low organic matter, as crop damage can occur.

For spot treatments in pasture and non-crop land, apply 0.165 L in 25 L of water to treat a 10 m x 10 m area. For patch treatment of leafy spurge and horsetail, apply 0.460 L in 25 L of water to treat a 10 m x 10 m area.

Water Volume:

Fall stubble: 10 to 20 gallons/acre (45 to 90 L/acre).

Pastures, shelterbelts: 10 to 30 gallons/acre (45 to 135 L/acre). For poison ivy, apply 50 to 100 gallons/acre (225 to 450 L/acre).

Preseeding (field corn, soybeans and white beans only): 10 to 20 gallons/acre (45 to 90 L/acre).

Pressure:

Less than 300 kPa (45 psi).

Nozzles:

Flat fan.

How it Works:

Amitrol 240 is a systemic herbicide which inhibits pigment production, including chlorophyll. Whitening begins in 7-14 days, followed by plant death.

Effects of Growing Conditions:

Less than acceptable results may occur in dry weather.

Tank Mixes:

Herbicides: Amitrol 240 may be tank mixed with Roundup for improved control of certain weeds, including dandelion. Tank mix 1.68 L/acre Amitrol 240 with 0.5 L/acre Roundup. Follow directions on the Amitrol 240 and Roundup labels for timing and use precautions.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crops or weeds or use for hay or feed.

Recropping: Residues may affect crops for 8 months following application.

Aerial Application: Do not apply by air.

Storage: Do not store where temperatures may exceed 50°C or near open flames. Do not store below 4°C.

Tank Cleaning:

Rinse all sprayer parts several times with clean water. Rinse immediately after use to prevent corrosion of metal parts.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Caution eye irritant

Avoid breathing spray mist or vapours. Do not re-enter treated areas within 12 hours.

Anthem

Herbicide Group – 2
(Refer to page 16)

Anthem (For use in the Brown & Dark Brown soils of Saskatchewan with less than 4 percent organic matter)

Company:

Monsanto Canada Inc.

Formulation:

75 percent sulfosulfuron formulated as a water dispersible granule. 432g per case.

700 g / L 2,4-D Ester formulated as an emulsifiable concentrate. Container size: 1 x 10.3 L.

Adjuvant: Merge- 8 L.

Crop:

Spring wheat (including Kyle and Plenty durum)
(Do not underseed forage legumes).

Weeds Controlled:

Grass: Foxtail barley, green foxtail[1], quack grass[1], and wild oat.

Broadleaf: annual smartweed spp., cleavers, common chickweed, dandelion[2], kochia, lamb's-quarters, narrow-leaf hawk's-beard[3], perennial sow-thistle[2], redroot pigweed, stinkweed, stork's-bill, volunteer canola (including SMART varieties when tank mixed with 2,4-D), wild buckwheat, wild mustard

[1] Suppression only
[2] Spring seedlings are controlled and established plants are suppressed.
[3] Spring Seedlings only

Crop Stage:

From the 4 leaf stage up to emergence of the 4th tiller.

Weed Stage:

Wild oat: From emergence to the 6 leaf stage with no more than 3 tillers. For optimum weed control and crop yield, apply prior to tillering.

Annual broadleaf weeds: Apply to the seedling stage for optimum weed control.

Perennial weeds: Prior to flowering when plants are actively growing.

Cost:

$18.50/acre (1999 suggested retail price including adjuvant).

Rates:

Anthem - 0.011 kg (11 g)/acre or 40 acres/case
2,4-D 700 ester - 0.243 L / acre or 40 acres/jug
Plus: Merge at 0.2 L / acre.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre)

Pressure:

275 kPa (40 psi)

Nozzles:

Flat fan. Choose nozzles that provide optimum spray distribution and coverage at the appropriate spray pressure. Do not use flood jet or controlled droplet application equipment.

How it Works:

Anthem is a systemic herbicide that is absorbed by both leaves and roots and moves rapidly to the growing points of the plant. Growth of susceptible weeds stops soon after application. Symptoms include discoloration (yellowing, reddening, purpling) of new leaves and are visible 1-3 weeks after application, depending on growing conditions and susceptibility of target plants.

2,4-D is a systemic herbicide that causes twisting and bending of plant parts within 2-7 days followed by discolouration and plant death 3-4 weeks after application.

Effects of Growing Conditions:

For optimum results, do not apply to weeds growing under stress.

Tank Mixes:

Herbicides: None

Fertilizers: None

Insecticides: None

Restrictions:

Rainfall: Do not apply if rain is forecast during, or soon after, application.

Grazing: Do not graze in the year of treatment.

Pre-harvest interval: No information available on label. Contact manufacturer for information.

Recropping: Seed only wheat or SMART canola the year following application. If necessary, re-seed only to wheat in the year of application. Wheat (including durum), canola, barley, peas and flax may be grown two years after application.

For all other crops, allow at least 22 months following application and conduct a field bioassay prior to planting.

Aerial Application: Do not apply by air.

Storage: Store under cool, dry conditions (below 50° C) away from foodstuffs, feed or seed.

Environment: Do not apply to water or contaminate water when draining sprayer. Maintain a buffer zone of 30 m between the last spray swath and the edge of sensitive areas (shelterbelts, woodlots, or gardens). Leave a buffer zone of 6 m between the last spray pass and wetlands or ponds. Use precautions to AVOID DRIFT. Drift may cause soil residues that will injure subsequent crops.

Tank Cleaning:

Do not clean sprayer in an area where waste may drain into water bodies. Prepare a solution of 1% household ammonia (1L of 3 percent ammonia per 100L water) to thoroughly rinse all surfaces and flush all hoses. Repeat and then rinse with clean water. Remove all nozzles and clean separately. Dispose of wash solution by spraying in a waste area or on the treated field.

Hazard Rating:

Anthem: May cause slight skin irritation.
2,4-D Ester: Caution poison, eye irritant.
Merge adjuvant: Warning poison, skin irritant.

Assert 300 SC

Herbicide Group – 2

(Refer to page 16)

Company:

Cyanamid Crop Protection

Formulation:

300 g/L imazamethabenz formulated as a suspension concentrate

Crops:

Sunflowers (wild mustard control only), all spring wheats, and barley. Although registered for use on durum wheat, growers should be aware that injury to durum wheat, as a result of Assert applications, has been reported in Manitoba.

Weeds:

Weeds controlled in cereals:

Wild oats
Wild mustard
Stinkweed
Wild buckwheat (suppression only)
Tartary buckwheat (suppression only)

Weeds controlled in sunflowers:
Wild mustard
Stinkweed

Crop Stage:

Sunflowers - 2 to 8 leaf stage. Crop must be less than 15 inches (38 cm) tall except for semi-dwarf varieties, which must be less than 12 inches (30 cm), and dwarf varieties which must be less than 4 inches (10 cm). Stunting and head deformation can occur from applications made beyond recommended stages.

Cereals - 1 to 6 leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Wild oats - 1 to 6 leaf stage (all leaves, including tillers) up to 2 tillers. Wild mustard and stinkweed - cotyledon to 6 leaf stage. Suppression of wild buckwheat and tartary buckwheat - cotyledon to 4 leaf stage.

Cost:

Sunflower - $7.82/acre (wild mustard only).

Cereals - $12.20 to $14.96/acre (1999 suggested retail price).

Rates:

Sunflowers - Apply 0.34 L/acre. One 10.8 L container treats 32 acres.

Cereals - Apply 0.54 L/acre if majority of wild oats are in the 1 to 3 leaf stage. One container treats 20.3 acres.

Apply 0.67 L/acre if majority of wild oats are in the 4 to 6 leaf stage (all leaves, including tillers) up to 2 tillers. One 10.8 L container of Assert treats 16.6 acres.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

Apply in 5 to 10 gallons/acre (23 to 45 L/acre) water when tank mixing Assert with Estaprop, 2,4-D ester, or MCPA ester. For all other applications, apply in 10 gallons/acre (45 L/acre) water.

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Assert is a systemic herbicide that is translocated to growing points in plants. It is absorbed through the foliage and the roots of weeds. Symptoms appear in 1 to 2 weeks as yellowing of newest leaves which spreads, leading to browning and plant death.

Effects of Growing Conditions:

Do not apply Assert 24 hours before or after a frost. It works best at warm temperatures. Performs relatively consistently under dry conditions. If cold, wet soil conditions persist in the days after application, retillering of wild oats may occur. Do not apply to drought stressed sunflowers.

Tank mixes containing Refine Extra must be used within 12 hours or product degradation may occur. Refer to the product label for application details.

Fertilizers: None registered.

Insecticides: None registered.

Tank Mixes:

Spring wheat (including durum) and barley:
2,4-D Ester* – up to 224 g active ingredient per acre
Attain – 40 acres per case rate. NOT for durum wheat varieties.
Curtail M – 0.80 L/acre
Dichlorprop + 2,4-D (Estaprop only)* – 0.70 L/acre
Express Pack – 40 acres per case rate.
MCPA Ester * – up to 224 g active ingredient per acre
Refine Extra – 8 g/acre
Refine Extra (8 g/acre) + MCPA Ester (140-224 g active ingredient per acre)
Unity – "280 EC" (0.20 L/acre) + "75 WG" (4.4 g/acre)

Spring wheat and durum wheat only:
Dichlorprop + 2,4-D (Turboprop 600 only) – 0.70 L/acre
Puma/Puma Super ** – 0.15 L/acre

*apply in 5-10 gal/acre (23-45 L/acre). For all other tank mixes use 10 gal/acre (45 L/acre)

** use the 0.54 L/acre rate of Assert when tank mixing with Puma or Puma Super

Refer to tank mix partner for additional crop staging restrictions.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours will reduce control.

Grazing: Do not graze treated fields or cut treated forage for silage or hay. Matured barley and wheat grain or straw from fields treated with Assert can be fed to livestock.

Recropping:

Year After Application	Black and Grey Wooded Soils	Brown and Dark Brown Soils
Year 1	Spring wheat (including durum), barley, canola, field peas, flax, sunflowers	Spring wheat (including durum), Smart canola, barley, sunflowers
Year 2	Spring wheat (including durum), barley, canaryseed, canola, field peas, flax, oats, sunflowers	

Conduct a field bioassay (a test strip grown to maturity) the year before growing any crop not listed above. Lentils are known to be particularly sensitive to Assert residues in the soil. The additive effect of soil residues from the use of Assert and sequential applications of Ally or Amber (Amber not for use in Manitoba) herbicides on the same land area has not been determined. Crop rotation guidelines are not known and injury to rotational crops other than wheat (excluding durum) may occur. Plant only wheat (excluding durum) on fields where these herbicides have been used until a field bioassay demonstrates other crops can be grown successfully.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Tank Cleaning:

Non-labelled grass and broadleaf crops can be damaged by in-tank residues. The manufacturer does not provide enough information on tank cleaning to make recommendations.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Assure II

Herbicide Group – 1

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

Assure II - 96 g/L quizalofop-p-ethyl formulated as an emulsifiable concentrate.

Container size - 8 L for Assure II.

Crops:

Canola, flax (including low linolenic acid varieties), lentils, peas (field and processing), soybeans, alfalfa (seed production), and seedling bird's-foot trefoil, sainfoin, clovers (white, red, alsike and sweet) for seed production* and creeping red fescue for seed*.

* Since these crops have been registered under minor use application, the manufacturer assumes no responsibility for herbicide performance.

Weeds:

Green foxtail, barnyard grass, wild oats, quackgrass, volunteer corn, volunteer wheat, volunteer barley, volunteer oats.

Weed Stage:

Wild oat - At the 0.15 L/acre rate, apply from the 1 to 5 leaf stage before tillering begins. At the 0.20 L/acre rate applications can be made to plants with up to 2 tillers. Best results are likely to occur if applications are made before tillering begins.

Volunteer oats - 2 leaf to early tillering (best results achieved before tillering begins).

Green foxtail, barnyard grass, volunteer wheat, volunteer barley - 2 leaf stage until early tillering.

Volunteer corn - 2 to 6 leaf stage.

Quackgrass - 2 to 6 leaf stage.

Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Crop Stage:

No leaf stage restrictions, but do not apply beyond preharvest intervals listed in the table:

CROP	PREHARVEST INTERVAL DAYS
Canola	64
Flax (including low linolenic acid varieties)	82
Soybeans	80
Lentils	65
Peas	65

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Costs:

$12.38 to $24.75/acre (1999 suggested retail price).

Rates:

WEEDS	ASSURE II	
	L/ACRE	ACRES TREATED PER CONTAINER
Green foxtail, wild oats, volunteer wheat, barley, oats and corn	0.15	54
Barnyard grass, wild oats, quackgrass (suppression)	0.20	40
Quackgrass (season long control)	0.30	26

Add Hi-Mix at a rate of 0.5 to 1.0 L per 100 L spray solution or Sure-Mix at a rate of 0.5 L per 100 L spray solution. Use the highest rate when wild oats or quackgrass are present in the field or when growing conditions are poor.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

210 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan with 50 mesh or coarser nozzle screens.

How it Works:

Assure and Assure II are systemic herbicides which are rapidly absorbed and readily translocated from the treated foliage to the root systems and growing points of treated plants. Symptoms include a reduction in growth, and discoloration within 1 to 3 weeks.

Effects of Growing Conditions:

Crop injury may occur if crops are stressed because of drought or flooding. Less than acceptable weed control may be expected if weeds are under stress because of drought, flooding or cool weather.

Tank Mixes:

Herbicides: In canola Assure II may be tank mixed with: Muster (8 to 12 g/acre)

In soybeans Assure II may be tank mixed with: Pinnacle (2.2 to 3.3 g/acre).

In established creeping red fescue for seed, Assure II at 0.2 to 0.3 L/acre may be tank mixed with: Ally (3 g/acre)

Allow 24 hours after application before applying a broadleaf herbicide. If the broadleaf herbicide is applied first, wait 7 days before application of Assure II.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour of application may reduce control.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Recropping: No restrictions the year after treatment.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Environment: Do not apply within 15 m of sensitive habitats such as shelterbelts, wetlands, sloughs, or woodlots.

Tank Cleaning:

Remove nozzles, screens and flush tank, pump, hoses and boom with a minimum of 3 changes of water. Clean nozzles and screens separately.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning eye and skin irritant

This product contains 4 percent phenol, which has been determined to be of toxicological concern.

Atrazine

Herbicide Group – 5
(Refer to page 16)

Company:

Novartis Crop Protection (Aatrex Liquid, Aatrex Nine-0). United Agri Products (Atrazine 480, Atrazine 90 WG). Van Waters and Rogers Ltd. (Drexel Atrazine 500).

Formulations:

Aatrex Liquid / Atrazine 480 - 480 g / L atrazine formulated as a liquid.

Drexel Atrazine 500 - 500 g / L formulated as a liquid.

Aatrex Nine-0 / Atrazine 90 WG-90 percent atrazine formulated as a dispersible granule.

Container sizes - various.

Crops:

Corn (silage, field, sweet).

Weeds:

Common purslane
Lady's-thumb
Lamb's-quarters
Ragweed
Redroot pigweed
Smartweed
Volunteer clover
Wild buckwheat
Wild mustard
Wild Oats
Wormseed mustard

Crop Stage:

Preplant incorporated (PPI)

Pre-emergent surface treatments (after planting but before emergence of weeds and crop) - are recommended only on irrigated fields. Inconsistent weed control will occur if 0.5 inches (1.25 cm) of water / precipitation does not occur within 7 days of application.

Postemergence treatment - 1 to 6 leaf stage and when corn is less than 12 inches (30 cm) tall.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Broadleaf weeds (postemergence applications) - less than 4 inches (10 cm) tall.

Rates:

	RATES		
	ATRAZINE 90 WG, AATREX NINE-O	ATRAZINE 480, AATREX LIQUID	DREXEL - ATRAZINE 500
Preplant incorporated; Pre-emergence (irrigated corn only)	0.45 to 0.69 kg / acre	0.85 to 1.25 L / acre	0.81 to 1.21 L / acre
Postemergence	0.45 to 0.69* kg / acre	0.85 to 1.25* L / acre	0.81 to 1.21 L / acre

* Add 1.11 to 2.23 L / acre of oil concentrate **or** 6.88 L / acre crop oil with postemergence applications of these products.

Refer to the product label for complete mixing instructions.
A general guide to mixing can be found on page 26.

Crop injury may occur when Atrazine and oil is applied postemergence during cold weather.

Use the low rate on crops grown on sandy soils, and where weed infestations are light.

Cost:

$4.83 to $7.71/acre plus cost of adjuvant with post-emergent applications (1999 suggested retail price).

Water Volume:

15 to 30 gallons/acre (70 to 135 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan with 50-mesh or coarser screens.

How it Works:

Atrazine is a systemic herbicide which is absorbed by roots and foliage. Photosynthesis is blocked. Symptoms may be noticeable 7 to 10 days after treatment.

Effects of Growing Conditions:

Postemergent applications made during periods of cold weather may cause crop lightening. Hot, dry weather preceding postemergent applications may result in reduced weed control. Atrazine will move with soil if eroded.

Tank Mixes:

Herbicides: PPI - Eradicane (not sweet corn), Bladex.
Preemergent Surface - Banvel II[2], Bladex
Post-Emergence[1] - Banvel II (not sweet corn), Bladex, Pardner.

[1]do not use oils or adjuvants with postemergent tank mixes.
[2]Drexel Atrazine 500 only.

Fertilizers: For pre-emergence applications, nitrogen solutions or complete liquid fertilizers may replace all or part of the water as a carrier for some formulations of atrazine. AAtrex Nine-O and AAtrex Liquid may be impregnated onto dry granular fertilizers. Do not impregnate onto nitrate or super-phosphate.

Do not apply atrazine with nitrogen fertilizer after corn has emerged, as crop injury will occur.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours of postemergence applications may result in reduced weed control.

Grazing: Do not graze or cut for feed before ear emergence.

Recropping: All crops, except corn and triazine-tolerant canola, may be affected the year following the use of atrazine. Flax, peas and fababeans have some tolerance to atrazine residues and are usually not affected by rates of up to 0.9 L/acre (500 g/L formulations) or 0.5 kg/acre (90 percent atrazine formulations) applied the previous year. Other more sensitive crops may be affected 2 or more growing seasons after application.

Aerial Application: Do not apply by air.

Storage: Do not freeze Aatrex Liquid or Atrazine 480.

Environment: Do not mix or load within 30 m, or apply within 10 m, of any wells, lakes, streams, ponds, dugouts or sinkholes.

Tank Cleaning:

When finished spraying atrazine, run clean water through the tank, pump and lines. Drain and refill with 1 L of household ammonia per 100 L water. Circulate the solution through lines and nozzles. Let solution stand for several hours. Scrub inside surfaces but do not enter tank. Flush sprayer system with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Attain

Herbicide Group – 4
(Refer to page 16)

Company:

Dow AgroSciences.

Formulation:

The Attain package has 2 components: Attain A contains 180 g/L fluroxypyr and Attain B contains 564 g/L 2,4-D LV ester. Attain is formulated as an emulsifiable concentrate. Container sizes - Attain A - 9.6 L, Attain B - 2 x 8 L.

Crops:

Spring wheat (not durum) and barley.

Weeds and Staging*:

Weeds controlled include:

Bluebur
Burdock
Cleavers (1 - 4 whorls)
Clover (sweet)
Cocklebur
Field horsetail[1]
Flixweed
Goat's beard
Hoary cress[1]
Kochia
Lamb's-quarters
Mustards (except dog and tansy)
Plantain
Prickly lettuce
Ragweed
Round leaved mallow (1 - 6 leaf)
Shepherd's-purse
Stinkweed
Stork's-bill (1 - 8 leaf)
Sunflower (annual)
Vetch
Volunteer canola
Volunteer flax
Wild radish
Wild buckwheat (1 - 4 leaf)
Wild mustard

The following weeds will be controlled only when growing rapidly (control may be reduced when weed infestations are heavy).

Blue lettuce[1]
Dandelion[2]
Docks
Dog mustard
Field bindweed[1]
Field peppergrass
Lady's-thumb
Leafy spurge[1]
Oak-leaved goosefoot
Redroot pigweed
Russian thistle
Smartweed
Tansy
Tartary buckwheat

Weeds suppressed include:

Annual sow-thistle
Canada thistle[1]
Common chickweed(up to 3 inches (8 cm) in height
Hemp-nettle (2 - 6 leaf stage)
Perennial sow thistle[1]

*Unless specified, weeds should be in the 2-4 leaf stage

[1] Top growth only

[2] Spring rosettes only.

Crop Stage:

4 leaf to flag leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

$8.48/acre (1999 suggested retail price).

Rate:

Apply Attain A at 0.24 L/acre and Attain B at 0.40 L/acre. One case of Attain treats 40 acres. Make only one application per year.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

How it Works:

The components of Attain herbicide tank mix move within the plant to control exposed and underground plant tissues. The active ingredients in Attain mimic naturally occurring plant hormones which control weeds by disrupting normal plant growth patterns. Injury symptoms include epinasty (twisting of the stems and leaves) and swollen nodes.

Effects of Growing Conditions:

Attain activity is influenced by weather conditions. The temperature range for optimum activity is 12°C to 24°C. Reduced activity will occur when temperatures are below 8°C or above 27°C. Frost 3 days before or after application may reduce weed control and crop tolerance. Weed control may be reduced during stress conditions (drought, heat or cold stress) or if extremely heavy infestations exist.

Tank Mixes:

Herbicides:
In spring wheat (not including durum) and barley, Attain may be tank mixed with:
Achieve 80DG (0.1 kg/acre) plus Turbocharge adjuvant.*
Assert (0.53 to 0.65 L/acre)

In spring wheat (not including durum) only, Attain may be tank mixed with:
Horizon (0.095 to 0.115 L/acre) plus Score adjuvant.*
Puma Super (0.2 to 0.4 L/acre)

Insecticides: None registered.

Fungicides: None registered.

*Temporary crop injury (Achieve only) or reduced wild oat control may occur with these tank mixes.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not permit lactating dairy animals to graze fields within 7 days of application. Do not harvest forage or cut hay within 30 days of application. Withdraw meat animals from treated fields at least 3 days before slaughter.

Preharvest: Do not apply within 60 days of harvest.

Recropping: Wheat, barley, oats, rye, forage grasses, flax, canola, mustard, lentils and peas may be grown the year after an Attain application. There are no recropping restrictions the second year after application.

Aerial Application: Do not apply by air.

Storage: May be frozen. If frozen, bring to room temperature and agitate before use.

Tank Cleaning:

Drain tank, and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for 10 minutes. Fill the tank with water and recirculate for 15 minutes. Spray part of the mixture through the hoses, boom and nozzles. Drain tank. Remove nozzles and screens and clean them separately. If sprayer is to be used on crops other than cereals, repeat the above process again, and clean outside of sprayer equipment.

Hazard Rating:

Danger Poison. Warning Eye Irritant. Caution Skin Irritant.

Avadex BW/Avadex MicroActiv

Herbicide Group – 8
(Refer to page 16)

Company:

Monsanto Canada Inc.

Formulation:

400 g / L triallate formulated as an emulsifiable concentrate. Container sizes - 22.7 L, 115 L.

10 percent triallate formulated as a granular. Container size - 22.7 kg, 454 kg.

Crops:

- Spring wheat (including durum)
- Barley
- Canaryseed (granular formulation only)
- Flax (not including low linolenic acid varieties)
- Rapeseed (including canola)
- Mustard
- Field peas (liquid formulation only)
- Seedling alfalfa
- Seedling red clover
- Seedling alsike clover
- Seedling sweet clover
- Seedling bird's-foot trefoil

Use on forage seedling crops only when underseeded with a cover crop.

Weeds:

Wild oats.

Crop Stage:

May be applied in fall or spring prior to crop emergence. In spring, may be applied before seeding (all labelled crops) or after seeding (barley, canaryseed, spring and durum wheat only).

Weed Stage:

Pre-emergence.

Cost:

$9.21 to $16.97/acre (liquids), $11.26 to $22.51/acre (granulars) (1999 suggested retail price).

Rates:

Apply according to the tables.

Apply recommended rates for the companion crop when using in underseeded alfalfa, trefoil, or clover species.

Avadex BW Liquid Rates – Spring Treatment

CROP	APPLICATION TIMING	RATE (L/acre)		ACRES TREATED PER 22.7 L CONTAINER	
		Organic Matter		Organic Matter	
		4% or less	Greater than 4%	4% or less	Greater than 4%
Spring and durum wheat	Before Seeding[1] After Seeding	1.21 1.42	1.42 1.72	18.8 16.0	16.0 13.2
Barley	Before and After Seeding	1.42	1.72	16.0	13.2
Rapeseed (including canola), flax, mustard	Before Seeding	1.72	2.23	13.2	10.2
Peas (dry)	Before Seeding	1.72	1.72	13.2	13.2

[1] Do not apply this product before seeding wheat in soils with 4 percent or less organic matter (brown, dark brown or grey wooded soils) where discers are to be used for seeding. If an air seeder is to be used, it must be equipped with a depth control device to ensure accurate seed placement, otherwise crop injury may occur.

Avadex BW Granular Rates – Fall Treatment

CROP	RATE (KG/ACRE)			ACRES TREATED PER 22.7 KG CONTAINER		
	Organic Matter			Organic Matter		
	Less than 2%[1]	2-4%	Greater than 4%	Less than 2%[1]	2-4%	Greater than 4%
Spring and durum wheat	4.45	5.67	6.88	5.1	4.0	3.3
Barley, canaryseed	4.45	5.67	6.88	5.1	4.0	3.3
Rapeseed (including canola), flax, mustard	5.67	6.88	8.90	4.0	3.3	2.6

[1] Fall treatments conducted under minimum tillage are not recommended on soils with less than 2 percent organic matter.

Avadex BW Granular Rates – Spring Treatment

CROP	APPLICATION TIMING	RATE (KG/ACRE)		ACRES TREATED PER 22.7 KG CONTAINER	
		Organic Matter		Organic Matter	
		4% or less[1]	Greater than 4%	4% or less	Greater than 4%
Spring and durum wheat	Before Seeding[2,3] After Seeding	4.45 5.67	5.67 6.88	5.1 4.0	4.0 3.3
Barley, canaryseed	Before and After Seeding[2] (barley only)	5.67	6.88	4.0	3.3
Rapeseed (including canola), flax, mustard	Before Seeding[2]	6.88	8.90	3.3	2.6

[1] Minimum tillage treatments must be applied to fields with at least 2 percent organic matter.

[2] Minimum tillage treatments must be applied 10 to 14 days before seeding or incorporating. For minimum tillage treatments on spring and durum wheat, apply 5.67 kg/acre on soils with 4 percent organic matter or less and 6.88 kg/acre on soils with greater than 4 percent organic matter.

[3] Do not apply this product before seeding wheat in soils with 4% or less organic matter (brown, dark brown or grey wooded soils) where discers are to be used for seeding. If an air seeder is to be used, it must be equipped with a depth control device to ensure accurate seed placement, otherwise crop injury may occur.

Water Volume:

10 gallons/acre (45 L/acre), liquid formulation only.

Pressure:

200 kPa (30 psi), liquid formulation only.

Nozzles:

Flat fan, liquid formulation only.

Application:

The liquid formulation must be incorporated into soil that is free of lumps or trash. The liquid formulation is recommended for spring use because soils are left in an erosion prone state if the liquid is fall-applied. The granular formulation may be incorporated into trashy soil and is best suited for fall use.

Fall Applications (Conventional Tillage): Apply Avadex BW granules to fields that are in good working condition, without excessive trash. Heavy trash or lumpy, wet fields may require tillage prior to application. Avadex BW must be applied after October 1 but before soil freeze-up. Application before October 1 may result in reduced weed control. Only one incorporation is required in the fall. The second incorporation may be done in the fall (before soil freeze-up) or in the spring.

Fall Application (Minimum Tillage): Applications of Avadex BW granules should be made to standing stubble, chemical fallow, or summerfallow fields that are not prone to erosion. Do not apply to smooth, hard packed soils that may allow granules to drift. If excessive crop residue exists at the time of application, harrowing should be conducted to ensure the granules are in good contact with the soil. Apply when the soil begins to cool (less than 4°C) and within 3 weeks of soil freeze-up. Incorporation can be performed in the spring before seeding or as part of the seeding operation.

Spring Application (Conventional Tillage): Apply Avadex BW (liquid or granules) to fields that are in good working condition, without excessive trash. Heavy trash or lumpy, wet fields may require tillage prior to application. Liquid formulations should be applied to fields with 30 percent or less trash cover. Avadex BW may be applied before or after seeding of wheat, barley, or canaryseed and before seeding of canola, flax, mustard or peas (liquid only). If wheat is being seeded into soils with an organic matter content of less than 4 percent, Avadex BW should be applied after seeding.

Spring Application (Minimum Tillage): Avadex BW granules should be applied in spring and when the soil temperature is 4°C or less. Apply granules 10 to 14 days before incorporation. Do not apply more than 4 weeks before seeding is intended.

Incorporation:

Conventional Tillage: Avadex BW applications require 2 incorporations, with the second incorporation at right angles to the first. Using a seeder that provides soil disturbance equivalent to a cultivator may replace 1 incorporation. The first incorporation of the granular formulation should be completed within 48 hours of application and the second incorporation should be delayed an additional 48 hours or more. The first incorporation of the liquid formulation should be completed as soon as possible after spraying, while the second incorporation may be done any time prior to crop emergence.

Incorporate to a depth of 2 inches (5 cm) by setting disc or cultivator implements to cut 3 inches (7.5 cm) into the soil. Mixing the product to greater depths will dilute the herbicide, decrease wild oat control, and may cause injury to cereals. Ensure that cereals are seeded below the treated layer (2 to 3 inches or 5 to 7.5 cm). Incorporations performed after seeding should be conducted with harrows or other suitable tillage equipment adjusted so as not to disturb the seed. Harrowing does not provide effective incorporation if compact soil prevents penetration of harrow teeth, if trash accumulates in the harrow sections, or if the harrows bounce.

Minimum Tillage: Incorporation of Avadex BW granules in minimum tillage systems is achieved with one high disturbance incorporation, which can be conducted prior to seeding, or as part of the seeding pass. A high disturbance system is one that disturbs the soil enough so that emerged weeds are controlled by the operation (example - air seeder with cultivator shovels). Harrowing after the incorporation operation is recommended for best results.

For optimum results in minimum tillage systems, incorporate when wild oat growth is noticeable in the field, as this will ensure that the soil is warm enough for activation of Avadex BW.

Under excessively warm or wet conditions between application and crop emergence, control may be reduced. For best results on heavy wild oat infestations, use the conventional tillage guidelines for incorporation.

Summer Fallow: Incorporation can be done by a disc followed by harrowing at right angles, a vibrashank cultivator followed by harrowing at right angles, or double harrowing. The second operation can be delayed until spring. If summerfallow must be ridged to prevent soil erosion the granular formulation should not be used in the fall. Note that fall minimum tillage applied granules do not require incorporation in the fall. If soils must be ridged following application of the liquid formulation, ridging depth should be kept to a minimum as deep ridging may reduce wild oat control and increase crop injury.

How it Works:

Avadex BW is absorbed by germinating wild oat shoots. Death usually occurs before weed emergence. If conditions are dry or wild oats germinate from below the treated zone, the weeds may emerge, but will usually be controlled. As growth stops, leaves become bluish green in colour and brittle.

Effects of Growing Conditions:

Reduced control may result if prolonged cool conditions or dry soil conditions prevail at the time weeds are emerging. Thinning of wheat can occur under conditions of heavy rainfall or if cold soil conditions persist as the crop emerges.

Tank Mixes:

Herbicides: Avadex BW liquid may be tank mixed with liquid formulations of trifluralin for control of wild oats, green and yellow foxtail in wheat and barley. Apply after seeding but prior to crop emergence. Consult the recommendations for trifluralin for rates in different soil types.

Fertilizer: Avadex BW liquid alone, or tank mixed with liquid formulations of trifluralin, may be tank mixed with liquid fertilizer. Compatibility of the herbicide and liquid fertilizer should be checked. Follow the instructions on the herbicide label prior to adding the herbicide to the spray tank.

Avadex BW liquid may be sprayed on dry urea fertilizer. A minimum of 150 kg/ha (60 kg/acre) of dry urea fertilizer must be used. Only commercial blending is recommended.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall of at least 0.5 inches (1.5 cm) within 2 weeks of application is required for activation of Avadex BW.

Grazing: Do not graze the treated crop or use as hay or feed prior to crop maturity. Do not graze or feed treated forage crops in year of treatment.

Recropping: Do not seed tame oats the year after treatment with Avadex BW.

Aerial Application: Avadex BW Granular may be applied by air with attachments designed for applying low volumes of granules.

Storage: Do not freeze liquid formulations. Store granular formulations in a cool, dry place.

Tank Cleaning:

When finished spraying Avadex BW, run clean water through the tank, pump and lines. Drain and refill with clean water and 1 L of household ammonia per 100 L water. Circulate the solution through lines and nozzles. Let solution stand for several hours. Scrub inside surfaces but do not enter tank. Flush sprayer system with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison (liquid formulation)

Skin and Eye Irritant (granular formulation)

Avenge 200 C

Herbicide Group – 8
(Refer to page 16)

Company:

Cyanamid Crop Protection

Formulation:

200 g/L difenzoquat formulated as a solution.

Container size - 20 L.

Crops:

Alfalfa
Barley
Bird's-foot trefoil
Bromegrass
Canaryseed
Creeping red fescue
Crested wheatgrass
Fall rye (Cougar, Frontier, Kodiak, Puma, Rymin only)
Kentucky bluegrass
Meadow fescue
Orchard grass
Red clover
Reed canarygrass
Russian wild ryegrass
Sweet Clover
Timothy
Triticale (Welsh and Carman)
Wheat (Biggar, Bluesky, CDC Makwa, CDC Teal, Columbus, Conway, Cutler, Fielder, Genesis, Glenlea, Katepwa, Lancer, Leader, Neepawa, Oslo, Pasqua, Selkirk and Wildcat wheat varieties).
Winter wheat (Norstar only)

Use on forages only when underseeded to a cereal as listed above.

Weeds:

Wild oats.

Crop Stage:

Do not apply after the 6 leaf stage of cereal or grass crops.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

3 to 5 leaf stage.

Cost:

$16.78 to $20.33/acre (1999 suggested retail price).

Rate:

Apply Avenge 200 C at 1.42 to 1.72 L/acre. Use the higher rate if wild oat population exceeds 200 wild oats per m^2. One 20 L container treats 14.1 to 11.6 acres.

Water Volume:

Ground sprayer - 10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan directed 45° forward.

How it Works:

Avenge is mainly a contact herbicide. Symptoms appear in 3 to 7 days on newest leaves, which appear yellowed. Yellowing spreads, leading to browning and plant death.

Effects of Growing Conditions:

Crop injury is worse on cold or hot, humid days than when temperatures are moderate. Best weed control is attained when temperatures are 20 to 30°C, particularly when these temperatures follow application. Do not spray when crop or weeds are wet with heavy dew or rain. Do not apply when crop is under stress from drought, excessive moisture, or heat.

Tank Mixes:

Herbicides: In wheat and barley, Avenge may be tank mixed with:

2,4-D ester (up to 0.45 L/acre of 500 g/L formulation). Do not use amine formulations.
Buctril M (0.4 L/acre)
Curtail M (0.8 L/acre)
Dichlorprop + 2,4-D (0.71 L/acre)
2,4-DB (see 2,4-DB section for rates). May be used on cereals underseeded to forages.
MCPA ester (up to 0.45 L/acre of 500 g/L formulation). Do not use amine formulations.

In wheat only, Avenge may be tank mixed with:
Accord (0.054 to 0.068 L/acre)
Accord + **EITHER** Buctril M **OR** 2,4-D ester OR MCPA ester, **OR** Refine Extra.

In canaryseed, Avenge may be tank mixed with;
MCPA ester (0.38 to 0.45 L/acre)
Pardner (0.405 L/acre)

Insecticides: May be tank mixed with Lorsban and Pyrinex.

Fertilizers: None registered.

Allow a 5-day interval between the application of Avenge and other pesticides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours of application will reduce control.

Grazing: Do not graze or feed treated cereal crop for 8 weeks after treatment. Do not graze or feed treated forages in the year of treatment. Straw from treated fields can be fed to livestock 8 weeks after application.

Recropping: No restrictions the year after treatment.

Aerial Application: May be applied by air in 2 to 5 gallons/acre (8 to 20 L/acre) water volume.

Storage: May be frozen.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make a recommendation.

Non-labelled grass or broadleaf crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Banvel II

Herbicide Group – 4

(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

480 g/L dicamba solution.

Container sizes - 2 x 10 L jugs.

Crops:

Barley
Canaryseed
Chemfallow
Established turf
Fall stubble
Field corn
Oats
Pre-seeding cereals
Native grass pastures
Red fescue
Roadside
Spring rye
Spring wheat (including durum)
Winter wheat

Seedling grasses:
Creeping red fescue, Crested wheatgrass, Intermediate wheatgrass, Meadow fescue, Meadow foxtail, Orchardgrass, Pubescent wheatgrass, Slender wheatgrass, Smooth bromegrass, Streambank wheatgrass, Tall fescue, Tall wheatgrass, Timothy

Weeds:

Weeds controlled by Banvel II + 2,4-D amine or MCPA amine tank mixes for cereals:

Burdock
Canada thistle (top growth control only)
Cleavers (higher rate only)
Cocklebur
Corn spurry
Cow cockle
Flixweed
Green smartweed
Hemp-nettle (MCPA K mixes only)
Kochia
Lady's-thumb
Perennial sow-thistle (top growth control only)
Redroot pigweed
Russian pigweed
Russian thistle
Shepherd's-purse
Tartary buckwheat
Volunteer canola
Volunteer sunflower
Wild buckwheat
Wild radish

Weeds controlled by Banvel II + Roundup tank mixes for reduced tillage applications prior to seeding wheat, barley, rye, oats and field corn:

Downy brome
Flixweed
Cow cockle
Foxtail barley (suppression only)
Green foxtail
Kochia
Redroot pigweed
Russian thistle
Smartweed
Stinkweed
Volunteer canola
Volunteer cereals

Lady's-thumb
Lamb's-quarters
Persian darnel
Wild buckwheat
Wild mustard
Wild oats

Weed Stage:

Annual broadleaf weeds: 2 to 3 leaf stage.

Winter annuals: rosettes less than 2 inches (5 cm) across.

Canada thistle, sow-thistle in summerfallow: apply to Canada thistle and perennial sow-thistle before the bud stage. Must be applied to thistle with 6 to 10 inches (15 to 25 cm) of new growth.

Brush control in pastures: when brush is actively growing and is 6 feet (2 m) in height or less (in spring or early summer).

Canada thistle control in fall stubble: when thistles exhibit new growth and at least 2 weeks prior to a killing frost.

Crop Stage:

CROP	STAGE
Spring wheat, oats, barley	2 to 5 leaf.
Canaryseed	3 to 5 leaf
Winter wheat	In spring when crop is 6 to 10 inches tall (15 to 25 cm) - prior to flag leaf stage.
Spring rye	2 to 3 leaf
Corn, field	Banvel II alone as a broadcast spray: apply up to 8 inches (20 cm) height on the corn as it stands. Banvel II + 2,4-D as a broadcast spray: apply up to 4 inches (10 cm) height on the corn as it stands. When corn is higher, drop nozzles must be used to direct the spray to plant base. Apply no later than 2 weeks prior to tassle emergence and before the corn is over 20 inches (50 cm).
Red fescue	For seedling stands, apply when crop is 2 inches (5 cm) tall. For established red fescue, apply up to the flag leaf stage of the crop.
CROP	STAGE
Established turf	Apply to newly seeded grasses only after second mowing. Do not apply to bent grasses.
Seedling grasses	2 to 4 leaf

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

Cost of Banvel II when tank mixed with MCPA/2,4-D in cereals $3.06 to $3.85/acre - not including cost of MCPA/2,4-D.

Cost per L - $32.90. (1999 suggested retail price).

Rates:

See rate table on next page.

Water Volume:

Preseeding burnoff: 5 to 10 gallons/acre (23 to 45 L/acre)

Annual crops: 10 gallons/acre (45 L/acre)

Pastures, summerfallow and stubble: 10 to 20 gallons/acre (45 to 90 L/acre)

Corn: 20 to 30 gallons/acre (90 to 135 L/acre)

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Banvel II is a growth regulator type herbicide that is absorbed primarily by foliage but also through plant roots. It is a systemic herbicide that is translocated throughout plants, causing rapid, undifferentiated growth and bending and twisting of stems and leaves, resulting in plant death in 2 to 3 weeks.

Effects of Growing Conditions:

Crop damage (stunting, reduced seed set) can occur if the chemical is applied at any time other than the recommended stage. Do not apply to crop under stress from adverse environmental conditions, such as excess moisture, drought and disease. Apply when air temperature is between 10 and 25°C. Do not apply:

- when there is a risk of severe temperature fall in the night;
- under high humidity, temperatures above 30°C, or fog conditions, to prevent drift to sensitive crops;
- when wind is blowing toward a nearby sensitive crop;
- when winds are gusty up to 5 mph (8 km/hr).

Tank Mixes:

Herbicides:

Barley, wheat - Sencor (2-3 leaf stage), 2,4-D, MCPA
Winter wheat - 2,4-D, MCPA
Canaryseed, oats - MCPA
Corn, pastures and non-crop areas - 2,4-D
Chemical fallow, stubble - 2,4-D, Roundup, Touchdown
Red fescue, spring rye - 2,4-D
Seedling grasses - 2,4-D
Preseeding burnoff - Roundup

Fertilizers: None registered.

Insecticides: May be tank mixed with Decis, Lorsban and Pyrinex.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

CROP	RATE	
	L/ACRE	ACRES PER 10 L CONTAINER OF BANVEL II
Barley (tank mixed with 0.344 L/acre MCPA or 2,4-D amine - 500 g/L formulations)	0.093	107.5
Wheat (spring and winter) (tank mixed with 0.344 L/acre MCPA or 2,4-D amine - 500 g/L formulations)	0.093 - 0.117	107.5 to 85.5
Spring rye (tank mixed with 0.344 L/acre 2,4-D amine - 500 g/L formulations)	0.093 - 0.117	107.5 to 85.5
Canaryseed (tank mixed with 0.344 L/acre MCPA amine - 500 g/L formulations)	0.117	85.5
Oats (tank mixed with MCPA)	0.093 - 0.117	107.5 to 85.5
Corn, field	0.243	41
Corn, field (tank mixed with 0.344 L/acre 2,4-D amine - 500 g/L formulations)	0.117	85.5
Red fescue	0.243	41
Seedling grasses (tank mixed with 0.344 L/acre 2,4-D amine - 500 g/L formulations)	0.093 - 0.117	107.5 to 85.5
Pastures	0.84 - 1.86	12 to 5.5
Established turf	0.51	19.5
Chemical fallow (tank mixed with 0.445 L/acre of 2,4-D (500 g/L), 0.4 L/acre of Roundup or Touchdown 480, or 0.30 L/acre of Touchdown 640)	0.117 (Use 0.243 for wild buckwheat control when mixed with Roundup)	85.5
Thistle suppression on fall stubble	1.0 (Use 0.5 L/acre if mixing with Roundup)	10
Prior to seeding wheat, barley, oats, rye and field corn (tank mixed with 0.378 L/acre Roundup plus non-ionic surfactant at 0.5 L per 100 L spray solution)	0.127	78.5

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing and Harvest: Canaryseed - Use only as bird seed.

Corn - Do not graze cattle or harvest for silage until 7 days after treatment of Banvel II or Banvel II + 2,4-D amine.

Cereals, seedling grasses, pasture - If treated vegetation has been consumed by meat animals within 30 days of Banvel II application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Banvel II application without restrictions on slaughter.

Dairy cattle - no restrictions up to 0.50 L/acre.

Use the following guidelines for feeding Banvel II-treated forage to dairy animals:

RATE/ACRE	DELAY BETWEEN TREATMENT AND HAYMAKING/GRAZING (DAYS)
up to 0.5 L	0
0.501 L to 0.93 L	7
0.931 L to 1.86 L	14
1.861 L to 2.87 L	30

Recropping: Grow only cereals, corn, soybeans or white beans the year after treatment with the 1.0 L/acre rate. Grow only cereals, corn, field beans, soybeans or canola the year after applications of 0.5 L/acre. If applications are made after September 1, or if dry weather persists after application, crop injury may occur the following spring.

Aerial Application: May be applied by air on cereals only. Use a minimum of 2 gallons/acre (8 L/acre).

Storage: May be stored at freezing temperatures.

Tank Cleaning:

When finished spraying Banvel II, thoroughly hose down the inside as well as outside surfaces of equipment while filling the spray tank half-full of water. Flush by operating sprayer until the system is purged of the rinse water. Fill tank with water while adding 1 L of household ammonia for every 100 L of water. Operate the spray pump to circulate the ammonia solution through the sprayer for 15 to 20 minutes and discharge a small amount of ammonia solution through the spray boom and nozzles. Flush the solution out of the spray tank through the boom. Remove the nozzles and screens and flush the system with 2 tanks full of water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Basagran

Herbicide Group – 6

(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

480 g/L bentazon formulated as a solution.

Container size - 2 x 9 L jugs.

Crops:

Dry beans (including white, kidney, black and pinto)
Peas[1]
Fababeans
Corn (grain, silage, sweet and seed)
Flax (including low linolenic acid varieties)
Soybeans
Spring wheat (not durum)

Seedling legumes and grasses for seed production only:
alfalfa[2], red clover, alsike clover, sainfoin, bromegrass, creeping red fescue, meadow foxtail, orchardgrass, timothy and crested wheatgrass

[1] Field peas only. DO NOT apply to chickpeas.
[2] Can also be applied to established stands.

Cost:

$20.02 to $25.66/acre, not including adjuvant.

Repeat applications to perennial weeds - $40.04/acre.

(1999 suggested retail price).

Crop Stage:

CROP	STAGE
Soybeans	No restrictions
Dry beans	After the first trifoliate leaf stage
Corn (grain, silage, sweet and seed)	No restrictions
Peas (field and canning)	After 3 pairs of leaves
Fababeans	At least 4 inches (10 cm) tall
Flax (including low linolenic varieties)	After 2 inches (5 cm) in height
Turf	Must be established
Seedling forage grasses	1 to 7 leaf stage
Seedling forage legumes	After the third trifoliate leaf stage
Spring wheat	4 leaf stage to flag leaf

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Water Volume:

10 to 40 gallons/acre (45 to 180 L/acre). A minimum of 18 gallons/acre (80 L/acre) is recommended for optimum control. Higher water volumes should be used when the weeds are at the upper end of their recommended treatment stage.

Pressure:

275 kPa (40 psi) to 300 kPa (45 psi).

Nozzles:

Flat fan nozzles capable of delivering high water volumes. Direct nozzles 45° forward.

Weeds, Stages and Use Rates:

For spring wheat (not durum) apply Basagran at 0.40 L/acre plus 2,4-D amine or ester (500 g/L) at 0.30 - 0.40 L/acre. This combination will control the following weeds when applied at the 2 - 4 leaf stage of the weeds.

Bluebur
Burdock (seedlings only)
Cocklebur
Common plantain
Falseflax
Flixweed (spring seedlings)
Goat's-beard
Lady's-thumb
Lamb's-quarters
Sweet clover
Volunteer canola
Wild sunflower
Mustards (except dog and tansy)
Prickly lettuce
Ragweed
Redroot pigweed
Russian pigweed
Russian thistle
Shepherd's-purse
Stinging nettle
Stinkweed
Wild radish

Apply the rate of Basagran listed when weeds in the table are within the recommended height:

WEEDS	0.71 L/acre		0.91 L/acre	
	inches	(cm)	inches	(cm)
ANNUAL/WINTER ANNUAL WEEDS:				
Buttercup			2 - 4	(5 - 10)
Cleavers			1 to 3 whorl stage	
Cocklebur	3 - 7	(7.5 - 17.5)	7 - 12	(17.5 - 30.0)
Common chickweed			1 to 3 weeks after emergence	
Common groundsel			2 - 4	(5.0 - 10.0)
Common ragweed			1 - 2	(2.5 - 5.0)
Corn spurry			1 - 4	(2.5 - 10.0)
Giant Ragweed			2 - 6	(5 - 15)
Hairy galinsoga			2 - 3	(5.0 - 7.5)
Hairy Nightshade			0.2-0.8	(0.5 - 2.0)
Lady's-thumb (smartweed)	1 - 3	(2.5 - 7.5)	3 - 8	(7.5 - 20.0)
Lamb's-quarters			0.5 - 1.0	(1.3 - 2.5)
Purslane			1 - 2	(2.5 - 5.0)
Redroot pigweed			0.5 - 1.5	(1.3 - 3.8)
Russian thistle			1 - 3	(2.5 - 7.5)
Shepherd's-purse	Rosette-4	(Rosette-10.0)	4 - 10	(10.0 - 25.0)
Stinkweed	Rosette-2	(Rosette-5.0)	2 - 6	(5.0 - 15.0)
Stork's-bill			2 to 6 leaf stage	
Venice mallow	1 - 2	(2.5 - 5.0)	2 - 4	(5.0 - 10.0)
Wild mustard	1 - 5	(2.5 - 12.5)	5 - 10	(12.5 - 25.0)
Wild radish			1 - 2	(2.0 - 5.0)
PERENNIAL WEEDS:	Repeat application 7 to 15 days after first application (if necessary).			
Canada thistle	6 - 8	(15.0 - 20.0)		
Field bindweed	1 - 2.5	(2.5 - 6.0)		
Yellow nutsedge	6 - 8	(15.0 - 20.0)		

Add Assist or XA oil concentrates at 0.41 to 0.810 L/acre. If hot, humid conditions prevail (above 28°C and 80 percent relative humidity), use only the low rate of Assist or XA oil concentrates. Citowett Plus may be used on peas at 0.25 L per 100 L spray mixture.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

How it Works:

Basagran is a contact herbicide which interferes with photosynthesis and is absorbed primarily through leaves. Weeds turn chlorotic (yellow) in 3 to 5 days and then brown, usually within 2 weeks.

Effects of Growing Conditions:

Poor results will occur if temperatures are cool. Optimum results are achieved when applied at daytime temperatures between 20 and 28°C. Applications at temperatures greater than 28°C may result in crop injury.

Tank Mixes:

Herbicides: Pinnacle at 2.2 to 3.2 g/acre (Soybeans only)

Fertilizers: 2.4 L/acre of ammonium sulphate or 4 L/acre of urea ammonium nitrate (UAN or 28-0-0) only in soybeans without other tank mix products. Do not use brass or aluminium nozzles with liquid fertilizers..

Insecticides: None registered.

Allow 4 days between application of Basagran and other herbicides, fertilizers or insecticides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6-8 hours will reduce control.

Grazing: Do not graze the treated crop or cut for feed prior to crop maturity.

Recropping: No restrictions the year after application.

Aerial Application: May be applied by air for weed control in dry beans or soybeans only. Use 5 to 10 gallons/acre (23 to 45 L/acre) water volume. Assist or XA oil concentrate at 0.05 to 0.1 L/acre must be added. Do not use Assist or XA oil concentrate in excess of 0.1 L/acre as substantial crop injury could occur.

Crop canopy should not cover the weeds.

Storage: May be frozen.

Tank Cleaning:

Non-labelled broadleaf crops may be injured by in-tank residues.

Clean tank, nozzles, and lines with a strong detergent and rinse thoroughly after use. When tank mixing, follow tank mix instructions for cleaning tank mix partner as well.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Bladex L/Bladex 90 DF

Herbicide Group – 5
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulations:

Bladex L - 480 g/L cyanazine formulated as a flowable. Container size - 10 L.

Bladex 90 DF - 90 percent cyanazine formulated as a water dispersible granule. Container size - 10 kg.

Crops:

Corn (field), Bladex L - triazine-tolerant canola (TTC). Use only on the varieties Triton or Tribute.

Crop Stage:

CROP	TREATMENTS
Corn (preplant incorporated)	Bladex L + Eradicane Bladex L + Dual Bladex 90 DF + Eradicane Bladex 90 DF + Dual
Corn (pre-emergence)	Bladex L Bladex 90 DF
Corn (postemergence - 1 to 3 leaf stage of corn)	Bladex 90 DF + BioVeg
TTC (postemergence - 2 to 4 leaf stage of canola)	Bladex L

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Rates:

CROP	RATE	
	BLADEX L (L/acre)	BLADEX 90 DF (kg/acre)
Corn (preplant incorporated with Dual at 0.81 - 1.11 L/acre)	1.72 - 2.02	0.91 - 1.11
Corn (preplant incorporated with Eradicane at 1.72 - 2.23 L/acre)	1.72 - 2.02	0.91 - 1.11
Corn (pre-emergence) - irrigated fields only	1.92 - 2.33	1.01 - 1.21
Corn (postemergence with 1 L BioVeg per 100 L spray solution)	Not recommended	1.01
Triazine-tolerant canola (TTC) (postemergence)	1.21	Not recommended

Use the low rate on sandy soils or low organic matter soils. Do not use on soils below 1 percent organic matter.

Weeds:

Weeds controlled in corn include:

Barnyard grass
Black nightshade
Common purslane
Green foxtail
Kochia
Lady's-thumb
Lamb's-quarters
Oak-leaved goosefoot
Pigweed
Prostrate knotweed
Ragweed (common and false)
Russian thistle
Shepherd's-purse
Smartweed (annual species)
Stork's-bill
Wild buckwheat
Wild mustard
Wormseed mustard
Yellow foxtail

Weeds controlled in TTC include:

Chickweed
Cleavers
Common groundsel
Green smartweed
Hemp-nettle
Lady's-thumb
Lamb's-quarters
Redroot pigweed
Shepherd's-purse
Stinkweed
Volunteer flax
Volunteer canola (non TTC)
Wild buckwheat
Wild mustard

Weed Stage:

For postemergence applications, apply when green and yellow foxtail are in the 1 to 2 leaf stage and when annual broadleaf weeds are in the 2 to 4 leaf stage except cleavers - 1 to 2 whorls; and volunteer flax - 1 to 2 inches (2 to 5 cm) tall.

Costs:

Corn - $17.65 to $24.46/acre
Triazine-tolerant canola (postemergence)
$12.70/acre
(1999 suggested retail prices).

Water Volume:

In corn, use 15 gallons/acre (70 L/acre).

In triazine-tolerant canola, use 10 gallons/acre (45 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan nozzles with 50-mesh or coarser in-line and nozzle screens. Do not use felt filters.

Incorporation:

For preplant incorporated treatments, incorporate twice with a tandem disk or S-tine cultivator set no deeper than 4 inches (10 cm) and travel at a speed of 10 km/hr (6 mph).

How it Works:

Cyanazine blocks photosynthesis of susceptible weeds. Evidence of control should be visible within 1 week.

Effects of Growing Conditions:

Application during hot, humid weather may result in a lightening of leaf colour in triazine-tolerant canola. Postemergence applications on corn will cause crop injury if applied during periods of cold, wet weather, or if these conditions occur within 7 days of application.

Tank Mixes:

Herbicides: In corn (preplant incorporated), Bladex may be tank mixed with Eradicane 8-E, Dual, or Atrazine.

In triazine-tolerant canola (OAC Triton only), Bladex L may be tank mixed with Poast Ultra or Venture.

Fertilizers: Bladex 90 DF may be tank mixed with liquid fertilizers for preplant incorporated or pre-emergence application in corn. Conduct a compatibility test by performing a jar-test prior to mixing the products in the tank.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours may reduce control (postemergence applications).

Grazing: Do not graze or harvest for livestock feed prior to crop maturity.

Recropping: If corn rates are used, plant only corn or triazine-tolerant canola, cereals, potatoes, flax, rapeseed (canola), sunflowers, soybeans or peas the year after treatment.

If triazine-tolerant canola rate is used, no recropping restrictions the year after application.

Aerial Application: Do not apply by air.

Storage: Do not freeze Bladex L.

Tank Cleaning:

When finished spraying Bladex L / Bladex 90 DF, run clean water through the tank, pump and lines. Drain and refill with clean water. Flush sprayer system.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Poison

Breaker

Herbicide Groups – 4, 5

(Refer to page 16)

Company:

IPCO

Formulation:

Breaker contains 2 components in each case:

Metribuzin 75DF – 75 percent metribuzin as a water dispersible granule.
Container size – 2.5 kg

MCPA Amine – 500 g/L MCPA amine as a salt.
Container size – 1 x 10 L

Crop:

Spring wheat and barley. Certain barley varieties such as Klondike, Leduc, Johnson and other newer varieties may be sensitive to Breaker. Any resulting loss in yield is often more than offset by gains from weed control.

Weeds Controlled:

Burdock
Cocklebur
Chickweed
Flixweed (seedlings)
Green smartweed
Hemp-nettle[1]
Kochia
Lady's-thumb
Lamb's-quarters
Mustards (except dog mustard)
Ragweed
Redroot pigweed
Volunteer canola (non TTC)
Russian pigweed
Shepherd's-purse
Stinkweed

[1] Suppression only.

Crop Stage:

Apply at the 3 to 5 leaf stage.

Weed Stage:

Apply after emergence up to 2 inches (5 cm) tall.

Cost:

$6.25 per acre (1999 suggested retail price)

Rates:

Metribuzin 75DF at 100 g/acre plus MCPA amine at 0.4 L/acre (One case treats 25 acres)

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons / acre (45 L / acre)

Pressure:

275 kPa (40 psi)

Nozzles:

Flat Fan nozzles at 80° with a flow rating of no less than 0.2 US gallons (0.75 L) per minute at 40 psi. (i.e. 8002 or TK2)

How it Works:

Metribuzin is a systemic herbicide if absorbed by the roots and contact when foliar applied. It kills weeds by inhibiting photosynthesis. Yellowing and death of tissues occurs in 7 to 10 days. Good coverage is necessary for effective control with foliar applications.

MCPA is a systemic herbicide that is absorbed through the foliage and is translocated to growing areas of the plant. It is a plant hormone mimic that causes bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Crop height reductions or yellowing may appear if high temperatures (>27°C) or frost occur within 48 hours of application. If frost occurs, allow crop to recover before applying. **Do not use on soils with less than 3 percent organic matter.** On soils with low organic matter, heavy rainfall (30 mm) following application may result in crop injury and stand thinning.

Tank Mixes:

Herbicides: None

Fertilizers: None

Insecticides: None

Allow 5 days between the application of Breaker and annual grass herbicides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall within 6 hours will reduce control.

Grazing: Do not graze within 30 days of application.

Preharvest interval: None.

Recropping Interval: No restrictions the year after treatment. Injury may occur to subsequent crops in areas of overlap.

Aerial Application: Do not apply by air.

Storage: Store in closed original container in a dry area away from food or feed.

Tank Cleaning:

Spray equipment must be thoroughly cleaned to remove traces of herbicide that might injure other crops to be sprayed. Drain any remaining spray solution from the tank. Rinse the tank and fill with water, adding heavy-duty detergent at the rate of 0.25 L per 1,000 L of water and household ammonia (3 percent) at 1 L per 100 L. Cycle this mixture through the equipment and spray out. Repeat twice. Fill the spray tank with clean water and cycle for five minutes. Clean pump and nozzle screens thoroughly. Wash any spray mixture from the outside of the spray tank, nozzles and other machinery exposed while spraying.

Do not clean equipment upslope of water bodies or ditches, near cropland, or shelterbelts. Clean your sprayer away from areas where others are likely to walk.

Hazard Rating:

Metribuzin 75DF:
Caution – May be harmful if swallowed
Avoid contact with eyes or breathing spray mist

MCPA:
Warning – Poison

Buctril M

Herbicide Groups – 4, 6
(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

280 g/L bromoxynil and 280 g/L of MCPA ester formulated as an emulsifiable concentrate. Container size - 8 L.

Crops:

Barley
Oats
Wheat (spring, durum and winter)
Flax (including low linolenic acid varieties)
Canaryseed (seed production only)
Corn
Fall rye

Seedling grasses (for seed production only)
Bromegrass
Creeping red fescue
Crested wheatgrass
Intermediate wheatgrass
Meadow fescue
Orchardgrass
Reed canarygrass
Russian wild ryegrass
Slender wheatgrass
Tall wheatgrass
Timothy

Established timothy (for seed or hay)

Weeds Controlled and Staging:

Weeds controlled up to 4 leaf stage:
American nightshade
Bluebur
Ball mustard
Cocklebur
Cow cockle
Flixweed
Green smartweed
Kochia [2]
Lady's-thumb
Night-flowering catchfly
Pale smartweed
Redroot pigweed[1]
Russian thistle [2]
Scentless chamomile [3]
Shepherd's-purse
Volunteer canola
Volunteer sunflower

[1] May not be controlled in flax.
[2] Control before plants are 2 inches tall.
[3] Spring seedlings only.

Weed controlled up to 6 leaf stage:
Wild tomato

Weeds controlled up to 8 leaf stage:
Common groundsel
Common ragweed
Lamb's-quarters
Stinkweed
Tame buckwheat
Tartary buckwheat
Wild buckwheat
Wild mustard
Wormseed mustard

Weeds with top growth controlled:
Canada thistle
Perennial sow-thistle

Crop Stage:

Barley, oats, wheat - 2 leaf to flag leaf stage.

Winter wheat - 2 to 4 leaf stage in the fall or after growth resumes in the spring, but prior to flag leaf.

Fall rye - apply from the time growth commences in spring to early flag.

Canaryseed - 3 to 5 leaf stage.

Flax (including low linolenic acid varieties) - 2 to 4 inches (5 to 10 cm) tall.

Corn - 4 to 6 leaf stage.

Seedling forage grasses - 2 to 4 leaf stage.

Established timothy - apply prior to the flag leaf.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

$6.38/acre (1999 suggested retail price).

Rate:

0.405 L/acre. One 8 L jug treats 20 acres.

Water Volume:

Corn - 20 to 30 gallons/acre (90 to 135 L/acre).
Flax - 10 gallons/acre (45 L/acre).
Cereals - 5 to 10 gallons/acre (23 to 45 L/acre).
Seedling forage grasses - 15 gallons/acre (70 L/acre).
Established timothy - 15 gallons/acre (70 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan nozzles.

How it Works:

Bromoxynil is a contact herbicide. Therefore, good coverage is essential. Susceptible weeds turn brown and die in 3-5 days. MCPA is absorbed through the leaves and translocated throughout the plant. Small burnt spots appear on leaves within hours, and death of susceptible plants can take 2 weeks.

Effects of Growing Conditions:

Best weed control when humidity is high at the time of spraying and for the following day or two. Prolonged cool conditions may result in reduced weed control. Spraying during early morning may increase the risk of flax injury. Do not apply to flax, canaryseed or corn if daytime temperatures exceed 27°C within 48 hours before or after application.

Tank Mixes:

Herbicide Tank Mix Table:

Crop	Tank Mix Options
Flax	Fusion, Poast Ultra, Select
Low linolenic acid flax varieties	Select
Wheat (spring, durum and winter)	Accord*, Accord + Avenge**, Achieve*, Ally, Avenge*, Horizon*, MCPA amine, MCPA ester, MCPA K, Puma*, Puma Super*, Refine Extra (2.7 g/acre)
Barley	Achieve, Ally, Avenge, MCPA amine, MCPA ester, MCPA K, Refine Extra (2.7 g/acre)
Oats	MCPA amine, MCPA ester, MCPA K

*Spring (including durum) only. **refer to Avenge label for registered varieties.

Fertilizers: None registered.

Insecticides: May be tank mixed with Decis, Lorsban and Pyrinex.

Fungicides: May be tank mixed with Tilt.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crops or cut for feed within 30 days of application.

Recropping: No recropping restrictions the year after treatment.

Aerial Application: May be applied by air to wheat, barley, and oats only. Must be applied in 2 to 4 gallons/acre (9 to 18 L/acre) water volume. Use higher water volume when the majority of weeds are cow cockle, smartweed, hempnettle, pigweed, and Canada thistle.

Storage: Liquid formulation may be frozen.

Preharvest: Do not apply to flax or low linolenic acid varieties of flax within 60 days of harvest.

Tank Cleaning:

When finished spraying, thoroughly clean the sprayer by flushing with clean water containing detergent.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Casoron

Herbicide Group – 20
(Refer to page 16)

Company:

Uniroyal Chemical
(distributed by United Agri Products)

Formulation:

4 percent dichlobenil formulated as a granular. Container size - 3 kg, 15 kg.

Crops:

Shelterbelts.

Weeds:

Artemisia[1]
Bindweed[1]
Canada thistle[1]
Chickweed
Dandelion[1]
Foxtail (green and yellow)
Groundsel
Horsetail
Knotweed
Kochia
Lamb's-quarters
Loosestrife
Mustard
Nutsedge[1]
Pigweed
Plantain
Purslane
Shepherd's-purse
Smartweed
Sow-thistle
Spurge
Vetch[1]
Wild buckwheat[1]

[1] Controlled with fall applications at the higher rates.

Timing:

In early spring or late fall prior to annual weed emergence, or after cultivation has removed existing weeds.

Weed Stage:

Pre-emergence.

Cost:

$7.27/kg (1999 suggested retail price).

Rates:

45 to 70 kg/acre. At the low rate, a 15 kg bag will treat a 4 yd by 407 yd (4 m by 340 m) strip of shelterbelt. At the high rate, a 15 kg bag will treat a 4 yd by 256 yd (4 m by 214 m) strip of shelterbelt. If application is followed by 0.5 to 1.0 inches (1.3 to 2.5 cm) of irrigation, the lower rates are recommended.

How it Works:

Casoron is a systemic herbicide absorbed by plant roots as they germinate. Weeds are controlled before they emerge.

Effects of Growing Conditions:

Do not apply during periods of high soil temperatures (more than 15°C).

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Storage: Store in a cool, dry place. May be frozen.

Grazing: Do not graze in treated area.

Equipment Cleaning:

The manufacturer does not provide enough information on equipment cleaning to make recommendations.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean equipment away from areas where family members or others are likely to frequent or walk.

Champion Extra

Herbicide Group – 1, 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulations:

Champion: 92 g/L fenoxaprop-p-ethyl (plus safener) formulated as an emulsifiable concentrate. Container size - 2 x 8.1 L jugs.

Extra: 50 percent thifensulfuron methyl, 25% tribenuron methyl; formulated as a water dispersible granule. Container size - 2 x 162 gram containers

Crops:

Barley

Weeds:

Controlled:

Barnyard grass
Chickweed
Corn spurry
Cow cockle
Green foxtail
Green smartweed
Hemp-nettle
Kochia
Lady's-thumb
Lamb's-quarters
Redroot pigweed
Russian thistle
Shepherd's-purse
Stinkweed
Tartary buckwheat
Volunteer canola*/rapeseed
Wild buckwheat
Wild mustard
Wild oat

Suppressed:

Canada thistle
Cleavers
Round-leaved mallow
Scentless chamomile
Sow-thistle
Stork's-bill
Toadflax
(less than 15 cm tall)

*Not including Smart canola varieties.

Rate:

CHAMPION: 0.405 L/acre plus EXTRA: 0.008 kg/acre. One case treats 40 acres (16.2 ha). Add EXTRA to the tank first. Let agitate for a few minutes then add CHAMPION.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Crop Stage:

Apply at the 2-5 leaf stage with no more than 2 tillers. Treatment at the 3 to 4 leaf stage of the crop will give optimum crop tolerance and weed control. **Do not apply after the 2 tiller stage or crop injury will result. The 2 tiller stage generally occurs around 25 days after seeding.**

Weed Stage:

Grasses - apply when the weeds have 1 to 6 leaves, prior to the emergence of the 3rd tiller.

Wild buckwheat - 1 - 3 leaf stage

Cleavers - 1 - 3 whorl stage

Canada thistle, sow-thistle (suppression) - less than 6 inches (15 cm) tall, prior to bud stage.

Chickweed - 1 - 6 leaf

Round-leaved mallow(suppression) - 2-6 leaf stage (10-12 cm tall)

Toadflax - up to 6 inches (15 cm) tall. A control program for this weed includes both frequent tillage and chemical application.

Cost:

$20.95/acre (1999 suggested retail price)

Water Volume:

10 gallons per acre (45 L/acre)

Pressure:

275 kPa (40 psi)

Nozzles:

80° or 110° flat fan nozzles

How it Works:

Fenoxaprop-p-ethyl is a systemic herbicide that is translocated from treated leaves to growing points in plants. Symptoms in grasses include reduced leaf growth and chlorosis (yellowing) of treated leaves within 1 to 3 days. Plant death occurs within 14 to 21 days after application.

Thifensulfuron and Tribenuron are systemic herbicides that are absorbed by the foliage and are translocated to growing points within plants. Growth of susceptible plants stops shortly after application. Symptoms include discolouration (yellowing, purpling, reddening) of the newest leaves and are visible in 1 to 3 weeks. Eventually the entire plant discolours and dies.

Effect of Growing Conditions:

Substantially reduced control and/or crop injury can occur when plants are stressed by very hot combined with very dry conditions and low humidity, severe weather conditions, frost, low fertility, drought, water saturated soil, disease or insect damage.

Tank Mixes:

Herbicides: MCPA Ester 500 at 0.34 L/acre

Fertilizer: None registered

Insecticides: None registered

A time interval of 7 days prior to application or 4 days after application of Champion Extra tank mix is required before any other pesticide can be applied.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall within 4 hours of application may lessen degree of weed control.

Grazing: Do not graze the treated crops or cut for hay.

Preharvest: 50 days.

Recropping: No restrictions when used as directed.

Aerial application: Do not apply by air

Storage: Store product in closed, original container in a cool, dry, well ventilated room. Do not freeze. If stored for 1 year or longer, shake well before using.

Tank Cleaning:

To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Drain tank and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for a minimum of 5 minutes. Fill the tank with water while adding 1 litre of household ammonia (minimum 3 percent ammonia) for every 100 L of water. Flush hoses, boom and nozzles with the cleaning solution, then add more water to completely fill the tank. Circulate for 15 minutes. Again flush hoses, boom and nozzles with the cleaning solution, and then drain the tank. Remove and clean the nozzles and screens separately in a bucket containing a 1 percent solution of ammonia in water. If the spray equipment is to be used to spray crops other than cereals, repeat the above process and thoroughly wash the spray mixture from the outside of the spray tank and the boom. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing the water through the hoses and boom. Prior to using the sprayer again, flush the tank, boom and hoses for 5 minutes with fresh water.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent or walk.

Hazard Rating:

Caution Poison

Eye and skin irritants

Champion Plus

Herbicide Group – 1, 2, 4

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

The Champion Plus package contains 4 containers: 2 labelled "Champion FM" and 2 labelled "Plus". "Champion FM" contains 45 g/L fenoxaprop-p-ethyl, 210 g/L MCPA ester and 70 g/L 2,4-D ester, formulated as an emulsifiable concentrate. Container size - 8.1 L.

"Plus "contains 75 percent thifensulfuron methyl, formulated as a dry flowable. Container size - 81 grams.

Crops:

Barley.

Weeds:

Wild oats
Green foxtail
Yellow foxtail
Annual sunflower
Broadleaves
Burdock
Chickweed
Cocklebur
Corn spurry
Cow cockle
Field horsetail[1]
Flixweed[2]
Green smartweed
Hemp-nettle
Hoary cress[1]
Lady's-thumb
Lamb's-quarters
Mustards (except Dog and Green tansy)
Plantain[1]
Prickly lettuce
Ragweeds
Redroot pigweed
Russian pigweed
Russian thistle
Shepherd's-purse[2]
Stinkweed[2]
Vetch
Volunteer canola (including HTC'S)

Kochia
Canada thistle[1]
Wild buckwheat
Wild radish

[1] Top growth control only.
[2] Spring seedlings only.
[3] Suppression only.

Crop Stage:

2 to 5 leaf with a maximum of 2 tillers. Crop damage will occur if application is made earlier or later than the recommended leaf stages. Growers should be aware that injury to barley, as a result of Champion Plus applications made later than the recommended leaf stages, has been reported. Do **NOT** use beyond the 2 tiller stage, usually not more than 25 days after seeding.

Weed Stage:

Annual grass weeds: 1 to 5 leaf stage plus 2 tillers.

Broadleaf weeds: 2 to 4 leaf stage or less than 4 inches (10 cm).

Chickweed: 1 to 6 leaf stage.

Wild buckwheat: 1 to 3 leaf stage.

Cost:

$20.50/acre (1999 suggested retail price).

Rates:

The Champion Plus box will treat 20 acres.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° stainless steel flat fan tilted forward at a 45° angle. Screens 50 mesh or larger.

How it Works:

Fenoxaprop-p-ethyl is a systemic herbicide that controls grassy weeds. Symptoms include reduced leaf growth and yellowing of the treated plants within 1 to 3 days. Chlorosis progresses and death of plants usually occurs in 2 to 3 weeks. MCPA and 2,4-D are systemic herbicides which control certain broadleaf weeds. They are translocated within the plant and cause rapid undifferentiated growth, which results in death of susceptible plants. Thifensulfuron methyl is a systemic herbicide which inhibits growth of susceptible broadleaf weeds. Symptoms (gradual discoloration) may not be noticeable for 1 to 3 weeks after application.

Effects of Growing Conditions:

Do not apply to crop that is stressed by severe weather conditions, frost, low fertility, drought, water-saturated soil, disease or insect damage, as crop injury and poor weed control may result. Very hot temperatures before or after application will stress plants and may result in reduced grass control.

Tank Mixes:

Herbicides: None registered.

Fertilizer: None registered.

Insecticides: None registered.

Do not tank mix with any other chemical additives, pesticides, or fertilizers. Do not use a surfactant with this tank mix. A time interval of 7 days prior to application or 4 days after application of Champion Plus is required before any other pesticide can be applied.

Restrictions:

Rainfall: Within 2 hours may reduce weed control.

Grazing: Do not graze treated crop or cut for feed prior to crop maturity.

Recropping: No restrictions the year after treatment.

Aerial Application: Do not apply by air.

Storage: Do not freeze. If stored for 1 year or longer, shake well before using.

Tank Cleaning:

The "Plus" component of Champion Plus can cause severe injury to sensitive crops at very low concentrations. Sprayers used to apply Champion Plus should be flushed out immediately after Champion Plus is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia rinse (1 L of 3 percent ammonia per 100 L) prior to using the sprayer on sensitive crops. All nozzles, screens, and filters should be removed and cleaned after applying this product. Refer to label for detailed clean out instructions.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Curtail M

Herbicide Group – 4
(Refer to page 16)

Company:

Dow AgroSciences.

Formulation:

50 g/L clopyralid and 280 g/L MCPA ester formulated as an emulsifiable concentrate.

Container size - 8 L.

Crops:

Spring wheat (including durum), barley, and oats.

Weeds:

The following weeds are controlled:

Annual sow-thistle
Common groundsel
Dandelion (spring rosettes)
Flixweed (spring seedlings)
Kochia (suppression only)
Lamb's-quarters
Redroot pigweed
Russian pigweed
Scentless chamomile
Shepherd's-purse (spring seedlings)
Smartweed
Stinkweed (spring seedlings)
Tartary buckwheat
Volunteer canola
Volunteer sunflower
Wild buckwheat
Wild mustard

Canada thistle (season long control, some regrowth may occur in the fall)
Perennial sow-thistle (top growth control only)

Crop Stage:

3 leaf to just before the flag leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Annual broadleaf weeds - 1 to 4 leaf stage, except for flixweed, shepherd's-purse, stinkweed, kochia and scentless chamomile which are best controlled in the 2 to 4 leaf stage.

Canada thistle and perennial sow-thistle - after all thistles have emerged and when the majority are in the rosette to pre-bud stage.

Cost:

$11.50/acre (1999 suggested retail price).

Rates:

Apply at 0.80 L/acre (10 acres per 8 L container).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan nozzles tilted forward at a 45° angle.

How it Works:

Curtail M is a growth regulator type of herbicide which is absorbed through the foliage and translocated to all parts of the plant, causing undifferentiated growth which usually results in death of susceptible weeds.

Effects of Growing Conditions:

When weeds are stressed because of drought, flooding, hot or cool (less than 15°C) temperatures, weeds are not actively growing and control may be reduced. Do not apply to weeds stressed longer than 20 days from lack of moisture as poor control can result.

Tank Mixes:

In spring wheat (including durum) and barley, Curtail M at 0.80L/acre may be mixed with:

- Achieve 80 DG at 0.10 kg/acre plus Turbocharge at 0.5 L per 100L spry mixture.

In spring wheat (not including durum) and barley:

- Curtail M at 0.66** to 0.80L/acre may be mixed with Avenge at 1.4 to 1.7 L/acre (no aduvant required)*
- Curtail M at 0.60 L/acre may be mixed with Refine Extra at 0.008 kg/acre (8g/acre) plus a non-ionic surfactant at 0.2 L per 100 L spray solution.

In spring wheat (including durum), Curtail M at 0.80 L/acre may be mixed with:

- Horizon at 0.092 to 0.116 L/acre (92 to 116 mL/acre) plus Score at 0.8 L per 100 L spray mixture.
- Puma or Puma Super 0.40 L/acre (no adjuvant required).

In spring wheat (not including durum) Curtail M at 0.80 L/acre may be mixed with:

- Assert at 0.52 to 0.64 L/acre plus water pH adjuster at 1 package per jug Assert.

* - See avenge label for varietal restrictions. Allow a minimum of 5 days between the application of Curtail M plus Avenge and the application of any other pesticide, as poor weed control may result.

**- The 0.66 L/acre rate of Curtail M will control light infestations of Canada thistle, flixweed (spring seedlings only), lamb's-quarters, shepherd's-purse, stinkweed, wild mustard.

Check the label for additional crop staging restrictions.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours will reduce control.

Grazing: Do not graze treated fields within 7 days of application.

Recropping: Wheat, barley, oats, rye, corn, flax, canola, and mustard may be planted the year after application. Do not sow any other crops until the second year after application.

Aerial Application: Do not apply by air.

Storage: Store in a cool (above 5°C), dry area. If product is frozen, bring to room temperature and agitate before use.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops can be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Caution Eye Irritant

Dichlorprop + 2,4-D

Herbicide Group – 4

(Refer to page 16)

Company/Products:

United Agri Products (Turboprop 600)
Nufarm (Estaprop)
IPCO (Dichlorprop-D)

Formulation:

300 g/L of dichlorprop and 282 g/L of 2,4-D ester formulated as an emulsifiable concentrate.

Container size - 10 L.

Crops:

Barley, spring wheat (including durum), winter wheat.

Weeds:

Annual sow-thistle
Ball mustard
Bluebur
Burdock
Canada thistle [1]
Cocklebur
Curled dock [1]
Ragweed
Redroot pigweed
Round-leaved mallow
Russian pigweed
Russian thistle
Shepherd's-purse
Smartweed
Dog mustard
Flixweed
Hare's ear mustard
Indian mustard
Kochia
Lady's-thumb
Lamb's-quarters
Night-flowering catchfly [3]
Oak-leaved goosefoot
Perennial sow-thistle [1]
Toadflax [2]
Stinkweed
Stork's-bill
Tartary buckwheat
Tumble mustard
Volunteer canola
Volunteer sunflower
Wild buckwheat
Wild mustard
Wormseed mustard

[1] Top growth control only
[2] Suppression only
[3] Spring annuals only

Crop Stage:

Wheat (spring, durum) and barley - 4 leaf to early flag leaf.

Winter wheat - in spring after tillering but before early flag leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Treat weeds when actively growing in the 2 to 4 leaf stage. Lady's-thumb, smartweed, volunteer sunflower, volunteer canola, wild buckwheat and tartary buckwheat must be treated before the 4 leaf stage. Kochia and Russian thistle must be treated before weeds are 2 inches high. Toadflax should be treated before a majority reach 6 inches in height (suppression only).

Cost:

$5.85 - $6.28/acre (1999 suggested retail price).

Rates:

0.71 L/acre (one 10 L container treats 14 acres).

Water Volume:

5 to 20 gallons/acre (25 to 90 L/acre). Use a minimum of 10 gallons/acre of water to reduce the risk of drift.

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Dichlorprop and 2,4-D are systemic herbicides which are absorbed through foliage and roots and are translocated to actively growing areas within plants. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Applications made under dry conditions may result in reduced control. Crops under stress from adverse environmental conditions, such as excess moisture, frost or drought, may be injured. Best weed control when adequate soil moisture is present and warm temperatures prevail. Do not apply when daytime temperatures exceed 27°C.

Tank Mixes:

Herbicides:

	Spring Wheat (including durum)	**Barley**
Estaprop	Achieve 80DG, Avenge, Assert, Puma, Puma Super*, Horizon*	Achieve 80DG, Avenge, Assert*
Turboprop	Achieve 80DG, Avenge, Assert, Horizon*	Achieve 80DG, Avenge
Dichlorprop	Achieve 80DG*, Avenge, Assert*, Horizon*	Achieve 80DG, Avenge

* These combinations are only supported by the recommendations of the grass control product. Refer to the grass control product section in the Guide or the product label.

Note: Always refer to the label or the Guide section of the tank mix partner for additional restrictions on staging and varieties.

Fertilizers: None registered.

Insecticides: None registered

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Estaprop - Do not graze the treated crop or harvest for hay or feed within 40 days of application. Withdraw meat animals from treated fields at least 3 days before slaughter.

Dichlorprop-D/Turboprop 600 - Do not graze treated crops or cut for feed prior to crop maturity.

Recropping: No restrictions the year after application.

Aerial Application: Certain formulations may be applied by air. Refer to specific product labels for full details for application by air.

Storage: May be frozen.

Tank Cleaning:

Manufacturers of this product warn that even after thorough cleaning, the use of a sprayer that has come in contact with this product may cause damage to susceptible crops. Do not use spray equipment to apply other pesticides to crops sensitive to these products. To clean sprayer, rinse all parts several times with water, then fill sprayer with 1 L of ammonia (3 percent) per 100 L of water and let stand for 24 hours. Rinse several times after with clean water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Dual II

Herbicide Group – 15
(Refer to page 16)

Company:

Novartis Crop Protection

Formulation:

935 g/L metolachlor formulated as an emulsifiable concentrate.

Container size - 10 L.

Crops:

Corn (field, sweet, silage), soybeans, potatoes, dry beans, sweet white lupins, processing peas.

Weeds:

American nightshade
Barnyard grass
Eastern black nightshade
Fall panicum
Giant foxtail
Green foxtail
Hairy crabgrass
Old witch grass
Redroot pigweed[1]
Smooth crabgrass
Yellow foxtail
Yellow nutsedge[2]

[1] Suppression only.

[2] Preplant incorporated treatment only.

Crop Stage:

Preplant incorporated. In areas with good rainfall or under irrigation, may be applied as a pre-emergence surface treatment. When Dual II is applied after planting but prior to emergence, at least 0.5 inches of water (1.25 cm) is required within 10 days of application for proper activity.

Weed Stage:

Pre-emergence.

Cost:

$19.34 to $26.50/acre (1999 suggested retail price).

Rates:

0.81 to 1.11 L/acre (one 10 L container treats 12.3 to 9 acres). Use higher rates on heavy textured soils or when high populations of weeds are expected. Make only one application per season.

Water Volume:

15 gallons/acre (70 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Use flat fan nozzles, 50 mesh screens.

Incorporation:

Apply to a firm seed bed free of large clods or lumps. If using tandem disks, set disks to work the soil at a depth of 4 inches (10 cm) and operate at a speed of 6 km/hr (4 mph). If using an S-tine cultivator, set the implement to work the soil to a depth of 4 inches (10 cm) and operate at a speed of 10 km/hr (6 mph). Incorporation equipment should include rolling or western harrows.

How it Works:

Dual II inhibits the germination of weeds, particularly grasses.

Effects of Growing Conditions:

A moderate rainfall or equivalent irrigation is required within 10 days to activate pre-emergent surface treatments. If rain does not occur, a shallow cultivation or use of a rotary hoe is necessary. Drought conditions that persist after any application may reduce annual grass control. On sandy soils, heavy rainfall following application may cause leaching of Dual II, resulting in reduced weed control.

Tank Mixes:

Herbicides: Corn - May be tank mixed with AAtrex in both PPI and pre-emergegent applications.

Fertilizers: May be applied with liquid fertilizer. May be impregnated onto dry bulk fertilizers (except nitrate fertilizers, superphosphate fertilizers or limestone).

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: When PPI, 0.5 inches (1.25 cm) of rain is required after application for proper activity.

Grazing: Do not graze the treated immature crop or cut for hay. In corn, immature means before ear emergence.

Recropping: In the year of treatment, seed only corn, soybeans, white beans, potatoes, snap beans, lima beans, processing peas, sweet white lupins, or (a minimum of 4.5 months after application) winter cereals. If Dual II has been applied in a tank mix with another product, consult those products' labels for additional recropping restrictions.

Aerial Application: Do not apply by air.

Storage: May be frozen.

Tank Cleaning:

Spray equipment should be throughly flushed with clean water and drained after application is complete. Do not let the mixed product stand in the spray tank without agitation.

Non-labelled crops can be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

DyVel

Herbicide Group – 4

(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

84 g/L of dicamba and 336 g/L of MCPAK formulated as a solution.

Container size - 2 x 10 L jugs, 55 L, 110 L.

Crops:

Spring wheat (including durum), barley, oats, winter wheat.

Weeds:

Ball mustard
Burdock
Canada thistle (top growth control only)
Cleavers (suppression only)
Cocklebur
Common ragweed
Corn spurry
Cow cockle
False ragweed
Flixweed
Giant ragweed
Green smartweed
Hare's-ear mustard
Hemp-nettle
Indian mustard
Kochia
Lady's-thumb
Lamb's-quarters
Perennial sow-thistle (top growth control only)
Prostrate pigweed
Redroot pigweed
Russian pigweed
Russian thistle
Shepherd's-purse
Stinkweed
Tartary buckwheat
Tumble mustard
Wild buckwheat
Wild mustard
Wormseed mustard
Wild radish
Volunteer canola
Volunteer sunflowers

Crop Stage:

Spring wheat (including durum), barley or oats - 2 to 5 leaf stage. Note: Crop damage can occur if applications are made at other than the recommended crop stage.

Winter wheat - apply in spring when crop is 6 to 10 inches (15 to 25 cm) tall but before shot blade stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 4 leaf stage. For corn spurry, cow cockle, and hempnettle, apply at the 2 to 3 leaf stage.

Cost:

$5.18/acre (1999 suggested retail price).

Rate:

0.5 L/acre (one 10 L jug treats 20 acres).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 to 310 kPa (40 to 45 psi). To reduce the risk of drift damage to sensitive non-target crops, 150 to 200 kPa (20 to 30 psi) and higher water volumes are recommended.

Nozzles:

Flat fan. Select nozzles that produce a low number of fine droplets to reduce the risk of drift.

How it Works:

DyVel is a growth regulator type herbicide that is absorbed primarily by foliage but also through plant roots. It is a systemic herbicide that is translocated throughout plants, causing rapid, undifferentiated growth and bending and twisting of stems and leaves, resulting in plant death in 2 to 3 weeks.

Effects of Growing Conditions:

For best weed control, apply when temperature is between 10 and 25°C. Do not treat crops under stress from excessive moisture or drought. To avoid crop injury, do not apply when temperature exceeds 27°C, or when there is a risk of a severe drop in nighttime temperature.

Tank Mixes:

Herbicides: For spring wheat, DyVel at 0.50 L/acre may be tank mixed with Horizon at: 0.095 L/acre for wild oat control only, or 0.115 L/acre for additional control of green and yellow foxtail.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crop within 30 days of application.

Recropping: No restrictions the year after treatment.

Aerial Application: May be applied by air. Use a minimum of 2 gallons/acre (8 L/acre) water volume.

Storage: May be frozen.

Tank Cleaning:

When finished spraying DyVel, run clean water through the tank, pump and lines. Drain and refill with clean water and 1 L of household ammonia (3 percent) per 100 L water. Circulate the solution through lines and nozzles. Scrub inside surfaces but do not enter tank. Flush sprayer system with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

DyVel DS

Herbicide Group – 4
(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

110 g/L dicamba, 295 g/L 2,4-D amine and 80 g/L mecoprop formulated as a solution.

Container size - 2 x 10 L jugs, 55 L, 110 L.

Crops:

Spring wheat (including durum), winter wheat, barley, corn (field and sweet), summerfallow and as a fall stubble treatment.

Weeds:

See Rates for a list of weeds controlled.

Crop Stage:

Spring wheat - 3 to 5 leaf stage. Barley - 2 to 3 leaf stage. Applications outside the recommended stage may result in crop injury.

Winter wheat - before crop is 12 inches (30 cm) tall in spring.

Corn - before corn reaches 6 inches (15 cm) in height with the top leaf extended.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 3 leaf stage. Cleavers - apply at the 1 to 2 whorl stage. Fall stubble - Canada thistle should be treated when 6 to 8 inches (15 to 20 cm) of new growth is present.

Summerfallow - Canada thistle should be in early bud stage.

Rosette stage for winter annuals in winter wheat.

Cost:

$4.32 to $5.72/acre in crop applications.
$5.73 to $9.02/acre for stubble and summer fallow.

(1999 suggested retail price).

Rates:

Spring wheat, winter wheat, corn - 0.34 to 0.45 L/acre (one 10 L container treats 29 to 22 acres).

Barley - 0.34 L/acre (one 10 L container treats 29 acres).

Stubble, summerfallow- 0.45 to 0.71 L/acre (one 10 L container treats 22 to 14 acres).

Use the low registered rate for each crop to control the following weeds:

Annual smartweed
Annual sow-thistle
Cocklebur
Common ragweed
Corn spurry
Hedge bindweed
Knotweed
Kochia
Lady's-thumb
Lamb's-quarters
Mustards (wild, ball, tall, wormseed, yellow)
Prostrate pigweed
Redroot pigweed
Russian thistle
Stinkweed,
Volunteer canola
Volunteer tame buckwheat
Wild buckwheat

Use the high registered rate for each crop to control the following weeds:

Canada thistle (top growth control only)
Cleavers (suppression only)
Cow cockle
Field bindweed
Flixweed
Round-leaved mallow (suppression only)
Shepherd's-purse
Tartary buckwheat

The high rate should be used for all weeds under adverse growing conditions, when weeds are at an advanced stage of growth or when weed densities are high. Guidelines are not provided for weed densities under light or heavy infestations. When in doubt as to the infestation level, use the high rate or contact your local BASF representative.

Water Volume:

Minium 10 gallons/acre (45 L/acre) in cereals. Corn - 20 to 35 gallons/acre (90 to 160 L/acre).

Pressure:

200 - 275 kPa (30 - 40 psi).

Nozzles:

Flat fan.

How it Works:

DyVel DS is a growth regulator type herbicide that is absorbed primarily by foliage but also through plant roots. It is a systemic herbicide that is translocated throughout plants, causing rapid, undifferentiated growth and bending and twisting of stems and leaves, resulting in plant death in 2 to 3 weeks.

Effects of Growing Conditions:

Crops under stress from excess moisture, drought or disease may suffer a setback when this herbicide is applied. Do not apply when temperature exceeds 27°C or when relative humidity is high. Stubble treatments for thistle control in fall should be made at least 2 weeks prior to killing frost.

Do not apply DyVel DS at wind speed greater than 5 mph (8 km/hr).

Tank Mixes:

Herbicides: Corn - Atrazine

Spring wheat - Puma Super (see Puma Super)

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze or harvest for livestock feed within 30 days of application. Do not permit lactating dairy animals to graze fields within 7 days of application. Withdraw meat animals from treated fields at least 3 days before slaughter.

Recropping: No restrictions the year after treatment.

Aerial Application: Do not apply by air.

Storage: May be frozen.

Tank Cleaning:

The manufacturer of this product warns that the use of a sprayer that has come in contact with this product may cause damage to susceptible crops. Restrict use of your sprayer to crops on which DyVel DS is registered if you have used this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Edge

Herbicide Group – 3

(Refer to page 16)

Company:

Dow AgroSciences

Formulation:

Edge DC - 60 percent ethafluralin formulated as a dispersible concentrate. Container size - 20 x 0.75 kg water soluble packets.

Edge Granular - 5 percent ethafluralin formulated as a granular. Container size - 25 kg or 544 kg.

Crops:

Canola, peas, mustard (yellow only), lentils (fall application only), safflower, sunflowers, seedling alfalfa (seed production only), fababeans, soybeans, dry beans (white or kidney), caraway, coriander.

Weeds:

Grasses Controlled:

Wild oats
Yellow foxtail
Barnyard grass
Green foxtail
Volunteer spring wheat

Broadleaf Weeds Controlled:

Chickweed
Redroot pigweed
Purslane
Cow cockle
Corn spurry
Lamb's-quarters
Prostrate pigweed
Wild buckwheat
Kochia

Weeds Suppressed:

Volunteer barley
Russian thistle
Nightshade
Lady's-thumb
Hemp-nettle
Cleavers

Rates:

PRODUCT/ TIME OF APPLICATION	RATE (KG/ACRE)				
	LIGHT TEXTURED SOILS		MEDIUM TO HEAVY TEXTURED SOILS		
	2-6% Organic Matter/Dark Brown-Black	6-15% Organic Matter Deep Black	2-4% Organic Matter Dark Brown	4-6% Organic Matter Black	6-15% Organic Matter Deep Black
Spring Edge DC	0.57	0.77	0.57	0.77	0.77 - 0.93
Spring Edge Granular	6.9	8.9	6.9	8.9	8.9 - 11.3
Fall Edge Granular	8.9[1]	11.3	8.9	11.3	11.3

[1] To conserve crop residue one incorporation may be completed in the fall and the second incorporation completed in the spring prior to planting.

Edge DC is registered for fall application, however it is not recommended where the required incorporation leaves soil vulnerable to wind and water erosion. Do not apply Edge to peat soils, soils containing less than 2 percent organic matter or soils containing greater than 15 percent organic matter. Application to eroded knolls or grey-wooded soils with highly variable texture or organic matter may result in reduced crop stand, delayed development or reduced yields in either the treated or rotational crop. To reduce the possibility of injury to the treated crop, use good quality certified seed. Seed shallow into a warm, moist, firm seedbed using recommended agronomic practices that will promote rapid and even crop germination and emergence.

Special instructions for lentils:
Edge is registered for use on lentils for fall application only. One incorporation must be completed in the fall. Seeding depth is critical - do not seed more than 1.5 inches (4 cm) deep. Avoid loose seedbeds and planting into cold soils.

Crop Stage:

Preplant incorporated.

Weed Stage:

Pre-emergence.

Cost:

$14.87 to $24.27/acre (Edge DC)
$13.52 to $22.15/acre (Edge Granular)
(1999 suggested retail prices).

Water Volume:

10 gallons/acre (45 L/acre) - (Edge DC only).

Pressure:

250 to 275 kPa (35 to 40 psi).
(Edge DC only.)

Equipment and Nozzles:

Apply Edge DC using a ground sprayer. The sprayer must be equipped with a jet, sparge or mechanical agitator. Return line agitation is not sufficient to keep the product in suspension. Use 16 mesh screens in the agitation cycle, 50 mesh screens at the nozzles.

Apply Edge Granular using a calibrated granular applicator.

Mixing:

Edge DC - Fill the tank one third full with clean water and begin agitation. Add all of the required Edge DC packets directly into the spray tank. Continue agitation. Wait 10 minutes, then continue filling the tank with water. Prior to spraying, wait 5 more minutes with agitation running after filling is complete.

Incorporation:

Two incorporations are required at right angles for thorough mixing. The first incorporation must be completed within 24 hours of spraying. When using Edge DC, the second incorporation may be done immediately after the first. When using the granular formulation, delay the second incorporation for at least three days after the first. If applying Edge granular in the fall, it is preferred that both incorporations be done in the fall. The second incorporation may be delayed until spring to conserve trash; however, both incorporations must be done to the same depth.

Incorporate with a tandem disk, disker or field cultivator (Vibrashank type). A Vibrashank type cultivator should have 3 to 4 rows of sweeps spaced 8 inches apart and staggered so that no soil is left unturned. Set equipment to work at a depth of 3 to 4 inches (8 to 10 cm). Operate disk implements at 4 to 6 mph (7 to 10 km/hr), cultivators at 6 to 8 mph (10 to 13 km/hr).

How it Works:

Edge inhibits growth of root and shoot tips as weeds germinate and begin to emerge. If the shoot portion of affected plants escapes to the soil surface, lateral and secondary root growth continues to be inhibited, which may result in a less competitive plant.

Effects of Growing Conditions:

Crops stressed by cold weather, excessive moisture or drought may be injured by Edge. Dry soil conditions between application and emergence may result in decreased weed control.

Tank Mixes:

Herbicides: Edge DC may be tank mixed with Sencor for use on peas and fababeans. Add Edge DC to the tank first. Ensure that the soluble packaging has completely dissolved prior to adding the Sencor.

Fertilizers: Do not mix Edge DC with liquid fertilizer.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No effect once incorporated.

Grazing: Do not graze or cut treated crops for livestock feed prior to crop maturity.

Recropping: Red beets, oats, canaryseed and small-seeded grasses may be affected the year after treatment. Damage to wheat may occur if the crop is seeded onto land that has been treated with broadleaf weed control rates of trifluralin or Edge for 2 consecutive crop years. Thinning of crop may occur in areas that have received abnormally low amounts of precipitation or in crops that are emerging slowly.

Aerial Application: Do not apply by air.

Storage: Store in a cool, dry place. Edge Granular may be frozen. Do not freeze Edge DC. Do not expose to prolonged sunlight or heat.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make a recommendation.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Embutox 625/Cobutox 600/Caliber 400

See 2,4-DB page 44.

Eptam 8-E

Herbicide Group – 8
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

800 g/L of EPTC formulated as an emulsifiable concentrate.

Container size - 10 L.

Caution:

The level of weed control will be reduced where Eptam 8-E is used on soils that have been treated with Eradicane or Eptam 8-E the previous growing season. It is expected that the reduction in control will be greater where Eradicane or Eptam 8-E have been used repeatedly for 2 or more years.

Crops:

Dry beans, flax, potatoes, seedling alfalfa (seed production only), seedling bird's-foot trefoil (seed production only), sunflowers. **NOTE: The use of Eptam 8-E on flax is not recommended in Saskatchewan because of the risk of crop injury.**

Weeds:

Barnyard grass
Chickweed
Corn spurry
Green foxtail
Hairy nightshade
Henbit
Lamb's-quarters
Nettleleaf goosefoot
Purslane
Pigweed (prostrate, redroot, tumble)
Volunteer cereals (wheat, barley, oats)
Yellow foxtail
Yellow nutsedge

Crop Stage:

Preplant incorporated.

Weed Stage:

Pre-emergence.

Cost:

Field crops: $15.15 to $23.57/acre
Potatoes: $18.28 to $36.56/acre

(1999 suggested retail price).

Rates:

CROP	RATE (L/ACRE)	ACRES TREATED PER 10 L CONTAINER
Dry and snap beans	1.72 - 2.23	5.8 - 4.5
Seedling alfalfa, seedling bird's-foot trefoil, sunflowers	1.72	5.8
Potatoes	1.72 - 3.44	5.8 - 2.9
Flax	1.42 - 1.72	7.0 - 5.8

Where a rate range appears, use the lower rate on light textured soils and the higher rate on heavy textured soils. Do not use on soils with less than 3 percent organic matter or more than 15 percent organic matter.

Water Volume:

Minimum of 10 gallons/acre (45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Equipment and Nozzles:

Since Eptam 8-E is highly volatile, the product must be incorporated immediately. This is best accomplished by mounting spraying equipment directly onto the incorporation equipment (tandem disks, field cultivators on light soil).

Incorporation:

All growth and stubble should be thoroughly worked into the soil before treatment. Apply to a dry soil surface. Incorporate immediately after application preferably during the spraying operation as Eptam 8-E is volatile. Set disc and cultivator implements to cut to a depth of 4 to 6 inches (10 to 15 cm). A second operation at a right angle to the first is required. The disc or cultivator must be followed with a harrow or other levelling device that extends beyond the width of the implement. Speeds in excess of 5 mph (8 km/h) will result in excessive pulverization and trash destruction leaving the field susceptible to erosion. The maximum recommended tillage depth is 4 inches (10 cm).

How it Works:

Eptam is absorbed by roots and coleoptiles of emerging grass weeds, and through the hypocotyl "hook" of emerging broadleaf weeds. Weeds are killed before they emerge.

Effects of Growing Conditions:

Crop injury can occur if stressful environmental conditions (cold, wet soils, drought or excessive heat) prevail after seeding. To minimize crop injury, delay seeding 10 days if these conditions prevail at the time of application, or select an alternative product. Very cold or dry soil conditions during weed emergence will reduce control.

Tank Mixes:

Herbicides: Potatoes - Eptam 8-E may be tank mixed with Sencor 75 DF. Do not use on red skinned potatoes, early varieties or on Belleisle, Tobique, or Shepody varieties. Do not use on soils with greater than 7 percent or less than 2 percent organic matter. Refer to Lexone / Sencor for cropping restrictions and specific rate information.

Dry beans (white and red kidney only) - Eptam 8-E may be tank mixed with liquid formulations of Treflan and Rival.

Fertilizers: May be mixed with liquid fertilizer. Compatibility test should be conducted according to instructions on the herbicide label. Dry bulk fertilizers, except nitrate fertilizers, may be impregnated or coated with Eptam 8-E. The impregnated fertilizer should be spread uniformly onto the field using a double overlap pattern immediately after impregnation. The impregnated fertilizer must be applied to the field when the soil surface is dry to at least 1/2 inch (1.5 cm) depth. The first incorporation must be done immediately after application.

Insecticides: Do not tank mix with insecticides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No effect once incorporated.

Grazing: Do not graze or feed treated crops to livestock.

Recropping: Will not injure crops the year after spring application.

Aerial Application: No labelled restrictions. However, since this product must be incorporated within seconds of application, aerial applications are impractical.

Storage: May be frozen.

Environment: Do not apply within 15 m of fish bearing waters or wildlife habitat.

Soil Type: Do not use on soils with less than 3 percent organic matter as crop injury will result.

Tank Cleaning:

The manufacturer does not provide enough label information on tank cleaning to make a recommendation. Contact the manufacturer for tank cleaning instructions.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Eradicane 8-E

Herbicide Group – 8
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

800 g/L of EPTC (plus safener) formulated as an emulsifiable concentrate.

Container size - 10 L.

Caution:

The level of weed control will be reduced where Eradicane 8-E is used on soils that have been treated with Eradicane 8-E or Eptam 8-E the previous growing season. It is expected that the reduction in control will be greater where Eradicane 8-E or Eptam 8-E has been used repeatedly for 2 or more years.

Crops:

Corn (field and silage).

Weeds:

Barnyard grass
Chickweed
Corn spurry
Green foxtail
Hairy nightshade
Henbit
Lamb's-quarters
Pigweed (prostrate, redroot, tumble)
Purslane
Quackgrass (suppression)
Volunteer cereals (wheat, barley, oats)
Wild oats
Yellow nutsedge
Yellow foxtail

Rates:

USE	RATE (L/ACRE)	ACRES TREATED PER 10 L CONTAINER
Annual weed control in light textured soils	1.72	5.8
Annual weed control in heavy textured soils	2.23	4.5
Quackgrass suppression	3.44	2.9

Crop Stage:

Preplant incorporated.

Weed Stage:

Pre-emergence.

Cost:

$17.04 to $34.07/acre (1999 suggested retail price).

Water Volume:

Minimum of 10 gallons/acre (45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Equipment and Nozzles:

Since Eradicane 8-E is highly volatile, the product must be incorporated immediately. This is best accomplished by mounting spraying equipment directly onto the incorporation equipment (tandem disks, field cultivators on light soil).

Incorporation:

All growth and stubble should be thoroughly worked into the soil before treatment. Apply to a dry soil surface. Incorporate immediately after application, preferably during the spraying operation, as Eradicane 8-E is volatile. Set disc and cultivator implements to cut to a depth of 4 to 6 inches (10 to 15 cm). A second operation at a right angle to the first is required. The disc or cultivator must be followed with a harrow or other levelling device that extends beyond the width of the implement.

How it Works:

Eradicane is absorbed by roots and coleoptiles of emerging grass weeds, and through the hypocotyl "hook" of emerging broadleaf weeds. Weeds are killed before they emerge.

Effects of Growing Conditions:

Poor weed control may result if soils are wet during incorporation.

Crop injury may result if soil is cold and wet during germination and emergence. Hot, dry conditions during germination and early crop growth may also lead to crop injury.

Tank Mixes:

Herbicides: Eradicane 8-E may be mixed with Bladex or with Atrazine.

Fertilizers: Dry bulk fertilizers, except nitrate fertilizers, may be impregnated or coated with Eradicane 8-E. The impregnated fertilizer should be spread uniformly onto the field using a double overlap pattern immediately after impregnation. The impregnated fertilizer must be applied to the field when the soil surface is dry to at least 1/2 inch (1.5 cm) depth. The first incorporation must be done immediately after application.

May also be mixed with liquid fertilizer. Conduct a compatibility test prior to mixing in tank. See label for instructions on conducting a compatibility test.

Insecticides: Do not tank mix with insecticides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No effect once incorporated.

Grazing: Do not graze treated crops or cut for feed prior to ear emergence.

Recropping: Will not injure crops the year after spring application.

Aerial Application: No labelled restrictions, however, since this product must be incorporated within seconds of application, aerial applications are impractical.

Storage: May be frozen.

Tank Cleaning:

The manufacturer does not provide enough label information on tank cleaning to make a recommendation.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Escort

Herbicide Group – 2

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

60 percent metsulfuron methyl formulated as a dry flowable. Container size - 0.25 kg.

Crops:

Pasture, rough turf, rangeland, and non-crop areas.

Weeds Controlled and Rates:

Rate	Weeds Controlled	
8 g/acre	Canada thistle[1] Dandelion[1] Russian thistle Sow-thistle[1]	Common tansy Kochia Scentless chamomile Sweet Clover
10 g/acre	Above weeds plus Canada thistle[1] Sow-thistle[1]	 Dandelion[1] Western snowberry
12 g/acre	Above Weeds plus Wild rose Canada thistle[1]	 Dandelion Sow-thistle[1]

At all rates add Agral 90, Agsurf, or Citowett at 0.2 L per 100 L of spray solution.

[1] Suppression only.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Crop Stage:

No restrictions on crop stage.

Weed Stage:

For seedling weeds apply to young plants up to 4 inches (10 cm) tall or wide. For established non-woody plants (biennial or perennial) apply up to the early bud stage. For western snowberry and wild rose apply between mid-June and mid August after the brush has leafed out, but before the leaves begin to turn their fall colours.

Cost:

$1.75 per g (Adjuvant extra) (1999 suggested retail price).

Water Volume:

10 to 20 gallons/acre (45 to 90 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

How it Works:

Escort is absorbed by leaves and roots, and rapidly stops growth of susceptible weeds. Discoloration is visible in 1 to 3 weeks.

Effects of Growing Conditions:

Do not apply during periods of intense rainfall or to soil saturated with water. Warm, moist conditions following treatment enhance the activity of Escort, while cold, dry conditions may reduce or delay activity. Brush hardened off by cold weather and drought stress may not be controlled.

Tank Mixes:

Herbicides: 2,4-D amine or ester at 0.79 L/acre (500 g/L formulations) plus surfactant.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: May be grazed on the day of treatment.

Aerial Application: Do not apply by air.

Storage: Store in a cool, dry place. May be frozen.

Tank Cleaning:

Escort can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Escort should be flushed out immediately after use. The manufacturer recommends that sprayers used to apply this product be flushed twice with 1 L of 3 percent household ammonia per 100 L of water. All nozzles, screens and filters should be removed and cleaned after applying this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Eye Irritant

Estaprop/Turboprop 600/Dichlorprop-D

See Dichlorprop +2,4-D page 90

Express Pack

Herbicide Group – 2,4
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

The Express Pack package contains 2 containers: 1 labelled Express herbicide and 1 labelled 2,4-D herbicide. Express herbicide contains 75 percent tribenuron methyl, formulated as a dry flowable.

Container size - 160 grams. 2,4-D herbicide contains 660 g/L 2,4-D LV ester, formulated as an emulsifiable concentrate. Container size - 10 L.

Crops:

Wheat (spring and durum), barley and summerfallow.

Weeds:

Weeds Controlled:

Annual sunflower
Ball mustard
Canada thistle[1]
Cow cockle
Flixweed [2]
Hare's-ear mustard
Indian mustard
Kochia
Lamb's-quarters
Narrow-leaved hawk's beard [2]
Prickly lettuce
Redroot pigweed
Russian pigweed
Russian thistle
Shepherd's-purse [2]
Stinkweed [2]
Sweet clover
Thyme-leaved spurge
Tumble mustard
Wild mustard
Wild radish
Wormseed mustard

[1] Top growth control
[2] Fall rosettes and spring seedlings

Weeds Suppressed:
Wild buckwheat

Crop Stage:

3 leaf to flag leaf.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Less than 4 inches (10 cm) tall or across.

Wild buckwheat - 1 to 3 leaf stage.

Kochia - 2 to 10 leaf stage.

Cost:

$4.18/acre (1999 suggested retail price).

Rate:

0.004 kg/acre Express plus 0.24 L/acre 2,4-D.

The Express Pack box will treat 40 acres.

Express may degrade if left in the sprayer for an extended period. Apply within 24 hours of mixing.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

210 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan nozzles with 50 mesh (or coarser) line strainers and screens.

How it Works:

Express rapidly inhibits the growth of susceptible weeds. Discoloration and death of weeds should be visible in 1 to 3 weeks.

Effects of Growing Conditions:

Do not apply to wheat, durum or barley that are stressed by severe weather conditions (frost, drought or water saturated soil, extreme heat), as crop injury may result. Under certain conditions (such as heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperatures), lightening in crop colour and reduction in crop height may occur.

Tank Mixes:

Herbicides: Express must be tank mixed with 2,4-D ester. Do not use Express alone.

In spring wheat and barley, Express Pack may be tank mixed with Assert.

In spring wheat only, Express Pack may be tank mixed with Accord.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours will reduce control.

Grazing: Do not graze or feed to livestock within 7 days of application.

Preharvest: Do not harvest forage or cut for hay within 30 days of application.

Recropping: No restrictions the year after treatment. Canola, flax, lentils and alfalfa may be planted 2 months after an application of Express Pack.

Aerial Application: Do not apply by air.

Storage: Store in a cool, dry place. May be frozen.

Tank Cleaning:

Express can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Express should be flushed out immediately after use. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water-household ammonia rinse (1 L of 3% ammonia per 100 L of water). All nozzles, screens and filters should be removed and cleaned after applying this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

FlaxMax Ultra

Herbicide Group – 1, 4

(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

Poast Ultra - 450 g/L of sethoxydim formulated as an emulsifiable concentrate.

FlaxMax - 50 g/L clopyralid and 280 g/L MCPA ester formulated as an emulsifiable concentrate.

One case of FlaxMax Ultra contains one 3.65 L container of Poast Ultra, two 8.1 L containers of FlaxMax, and one 8.1 L container of Merge.

Crops:

Flax.

Crop Stage:

Apply to flax that is 2 to 6 inches (5 to 15 cm) in height. Spraying at an early stage will reduce the risk of crop injury.

Cost:

$19.92 to $26.90/acre (1999 suggested retail price).

Weeds, Staging and Use Rates:

Annual Grasses 1 to 6 leaf stage	Annual Grasses 1 to 4 leaf stage	Annual Broadleaf Weeds 2 to 4 leaf stage	Perennial Weeds
Poast Ultra at 0.13 L/acre, Flaxmax at 0.61 L/acre, and Merge at 0.3 L/acre (27 acres per case) will control the following weeds:			
Barnyard grass, crabgrass, fall panicum, Persian darnel, proso millet, volunteer corn, green and yellow foxtail, witch grass	wild oat, volunteer barley, volunteer wheat	flixweed, lamb's-quarters shepherd's-purse stinkweed, volunteer sunflower, wild mustard	Canada thistle*
Poast Ultra at 0.19 L/acre, Flaxmax at 0.81 L/acre, and Merge at 0.4 L/acre (20 acres per case) will control the weeds listed above plus:			
wild oat, volunteer barley, volunteer wheat		annual sow-thistle common groundsel, redroot pigweed, Russian pigweed, scentless chamomile, smartweed, tartary buckwheat, volunteer canola, wild buckwheat	dandelion**, perennial sow-thistle*** Canada thistle

* Apply from 10 cm until early bud stage. This treatment will provide season long control of light Canada thistle infestations with some regrowth in the fall.

** Apply at the spring rosette stage.

*** Top-growth control only.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

240 to 275 kPa (35 to 40 psi).

How it Works:

The Poast Ultra component of FlaxMax Ultra is a systemic and a contact herbicide. It is absorbed through treated leaves and translocated to growing points. Susceptible grassy weeds turn yellow and then brown, with plant death occurring in 7 to 21 days. Clopyralid and MCPA (the FlaxMax component of FlaxMax Ultra) are growth regulator type herbicides which are systemic and are translocated to all parts of plants, causing rapid, undifferentiated growth in susceptible weeds. Epinasty (twisting and bending of leaves and stems) is apparent 2 to 3 days after application, with plant death occurring in 2 to 3 weeks.

Nozzles:

Flat fan nozzles tilted forward at an angle of 45°.

Effects of Growing Conditions:

When weeds are stressed because of drought, flooding or prolonged hot or cool temperatures (15°C or less), control can be reduced or delayed since weeds are not actively growing. Weed escapes may occur under prolonged stress conditions or low fertility. Do not apply to weeds stressed longer than 20 days because of lack of moisture as unsatisfactory control can result. Do not apply to crops that are under stress from heat, drought, or cool conditions as crop injury may result.

Tank Mixes:

Herbicides: None registered.

Insecticides: None registered.

Fertilizers: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within six hours may reduce control.

Grazing: Do not graze the treated crop or cut for livestock feed.

Recropping: FlaxMax Ultra residues in the soil may affect subsequent crops. Leave a minimum of 14 days between application of FlaxMax Ultra and replanting of barley, wheat, oat, and flax. A cultivation to a minimum depth of 4 inches (10 cm) is recommended before reseeding. Wheat, barley, oat, rye, corn, flax, canola or mustard may be planted the year after application. Do not seed any other crop until 2 years after application treatment.

Preharvest: Do not apply within 60 days of harvest.

Aerial Application: Do not apply by air.

Storage: Store above 5°C. If frozen, bring to room temperature and agitate before use.

Tank Cleaning:

When finished spraying FlaxMax Ultra, run clean water through the tank, pump and lines. Drain. Refill sprayer with clean water and 1 L of household ammonia (3%) per 100 L of water. Circulate the solution through lines and nozzles. Let solution sit in the tank for several hours (preferably overnight). Scrub inside surfaces of tank, but do not enter the spray tank. Flush sprayer system with water until thoroughly clean. Remove and clean nozzles and screens.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison
Warning Eye Irritant
Warning Skin Irritant

Fortress

Herbicide Group – 3,8

(Refer to page 16)

Company:

Monsanto Canada Inc.

Formulation:

10 percent triallate and 4 percent trifluralin formulated as a granular.

Container size - 22.7 kg bag, 454 kg container.

Crops:

Wheat (spring and durum), barley, canola, flax (not including low linolenic acid varieties), mustard.

Weeds:

Control of wild oats, green foxtail, yellow foxtail.

Suppression of lamb's-quarters, kochia, redroot pigweed, Russian thistle, wild buckwheat.

Crop Stage:

Apply preplant incorporated in fall after September 15 until soil freeze-up or in the spring prior to seeding crop.

Surface application: Apply in the fall after October 1 and when soil temperature is less than 4°C at a 2 inch (5 cm) depth and delay incorporation until the following spring. Do not apply to fields with heavy trash cover or after snow has fallen. Some wheat or barley injury may be noted on eroded knolls.

Weed Stage:

Pre-emergence.

Cost:

$13.53 to $20.92/acre (1999 suggested retail price).

Rates:

Apply Fortress according to soil organic matter content.

ORGANIC MATTER	RATE (KG/ACRE)					
	RAPESEED (CANOLA), FLAX, MUSTARD		BARLEY		SPRING WHEAT AND DURUM WHEAT	
	Spring	Fall	Spring	Fall	Spring	Fall
< 2%	5.67	5.67	N.R.*	4.45	N.R.*	N.R. *
2 - 4%	5.67	5.67	4.45	5.67	N.R.*	4.45
4 - 6%	6.88	5.67	5.67	5.67	4.45	5.67
> 6%	6.88	6.88	6.88	6.88	5.67	5.67[1]

*N.R. - Not Recommended.

[1] For fall incorporated applications (not surface) apply 6.88 kg/acre when organic matter exceeds 8 percent.

Application:

Fortress may be applied in the fall with or without a fall tillage operation, or in the spring as a preplant incorporated treatment. Before application of this product, the soil must be in good working condition. Application to a field that is wet, lumpy, rough or ridged will result in reduced weed control and promote crop thinning.

Fall Surface Application: Where fields are prone to water and/or wind erosion, and tillage is therefore undesirable, fall surface application should be made when the soil begins to cool (less than 4°C) and within 3 weeks of soil freeze-up, which usually occurs by October 1. Application can be made to standing stubble or to previously worked fields with incorporation delayed until spring. For best results on heavy wild oat infestations, use the incorporated treatment.

Fall Incorporated Application: Fortress must be applied after September 15 and before soil freeze-up. Application prior to September 15 may result in reduced weed control. An incorporation may be completed within 24 hours of application. The second incorporation may be done in the fall (prior to soil freeze-up) or in the spring prior to, or after, seeding. If performed after seeding, it must be completed with harrows prior to emergence of the crop. Fall incorporation is not recommended on soils where a lack of trash cover combined with the required incorporation operation could result in soil erosion.

Spring Application: Fortress can be applied before seeding but must be incorporated within 24 hours of application. The second incorporation must be delayed at least 48 hours after the first and may be performed at any time prior to crop emergence.

Incorporation:

Fortress applications require two incorporations, with the second incorporation at right angles to the first. Seeding with a seeder that provides soil disturbance equivalent to a cultivator may replace one incorporation. Incorporate to a maximum depth of 2 inches (5 cm) by setting disk or cultivator implements to cut a maximum of 3 inches (7.5 cm) into the soil. Mixing the product to greater depths will dilute the herbicide, decrease wild oat control, and may cause injury to cereals. If the second incorporation is conducted after seeding, it should be done with harrows or other suitable tillage equipment adjusted so as not to disturb the seed. Harrowing does not provide effective incorporation if compact soil prevents penetration of harrow teeth, if trash accumulates in the harrow sections, or if the harrows bounce.

Seeding Requirements:

Accurate seeding depth control is critical. Thinning of wheat and barley has been known to occur when seeding depth has been inadequate. Ensure that cereals are seeded below the treated layer (2 to 3 inches or 5 to 7.5 cm). Do not seed deeper than 3 inches (7.5 cm). To ensure an even crop stand, increase the usual seeding rate of wheat or barley by 10 percent, especially if soil conditions are cold or dry. See product label for more information.

How it Works:

Triallate is absorbed by wild oat shoots, and trifluralin is absorbed by foxtail roots and shoots. Weeds usually die before emergence. If foxtail plants emerge, root growth continues to be inhibited, resulting in a less competitive plant.

Effects of Growing Conditions:

Crop injury can occur on fields where Fortress has been applied and heavy rainfall or cold weather occur after seeding but prior to crop emergence. Seeding under warm soil conditions (greater than 10°C and generally after May 15) will ensure optimum crop germination and emergence and will reduce the risk of crop injury. Very dry conditions in spring or prolonged cool soil temperatures at time of wild oat germination will result in reduced control.

Poor results may be expected from incomplete incorporation due to wet, cloddy soil or heavy trash. Ridges left at seeding may disrupt the treated layer and allow weed escapes.

Restrictions:

Rainfall: Moisture is required for activation. Rainfall of at least 0.6 inches (1.5 cm) within 2 weeks of seeding is required to ensure optimum results.

Grazing: Do not graze or cut treated crops for livestock feed prior to crop maturity.

Recropping: Fortress will leave a residue in the soil. Oats, canaryseed, and small seeded forage grasses may be injured if planted within 24 months of application. Do not apply Fortress on land to be sown to wheat if the land has been treated with trifluralin since June 1 of the previous year.

Aerial Application: May be applied by airplane with attachments designed for applying low volumes of granules.

Storage: Store in a cool, dry place.

Hazard Rating:

Skin and Eye Irritant

Freedom Gold

Herbicide Group – 1, 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

Freedom Gold contains 2 components in each case:
Freedom – 75 percent thifensulfuron methyl as a water dispersible granule.
Container size – 1 x 320 g

Assure II – 96 g/L quizalofop-p-ethyl as an emulsifiable concentrate.
Container size – 1 x 8 L

Sure-mix adjuvant. Container size – 1 x 8 L.

Crop:

SMART (Imazidolinone tolerant) canola varieties 45A71, 46A73, 46A74 only.

Application of Freedom and Assure II together as a tank mix may result in temporary crop yellowing or delay in flowering.

*Application of Freedom Gold to canola varieties **without** the SMART trait will result in **crop death.***

Weeds Controlled:

Grasses: barnyard grass, green foxtail, quack grass[1], volunteer barley, volunteer corn, volunteer oat, volunteer wheat, wild oat.

Broadleaf Weeds: chickweed, corn spurry, cow cockle, green smartweed, hemp-nettle, kochia[1], lady's-thumb, lamb's-quarters, redroot-pigweed, Russian thistle, stinkweed, volunteer canola/rapeseed (except SMART varieties), wild buckwheat, wild mustard.

[1] Suppression only.

Crop Stage:

Freedom – 3 to 6 leaf stage prior to bolting. Do not apply before the 3 leaf stage. Application to crops prior to this stage, or with uneven germination, may result in crop injury.

Assure II – No leaf stage restrictions but must be applied more than 74 days prior to harvest.

Weed Stage:

Barnyard grass, green foxtail, volunteer barley, volunteer oat, volunteer wheat - 2 leaf to early tillering

Volunteer corn, quack grass (suppression) – 2 to 6 leaf stage

Wild oat, Volunteer oat – 1 to 5 leaf with no tillers at 0.15 L/acre of Assure II; 2 to early tillering at 0.20 L/acre of Assure II. Best results when applications made prior to tillering.

Broadleaf weeds – up to 10 cm (4 inches) tall with the following exceptions:

Chickweed – 1 to 6 leaf stage with good coverage
Wild buckwheat – 1 to 3 leaf stage

Cost:

$21.95 per acre (including adjuvant)
(1999 suggested retail price)

Rates:

Freedom – 8 grams per acre
Assure II – 0.15 to 0.20 L / acre
Sure-Mix – 5 L per 1000 L of spray volume
(One case treats 40 acres)

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L / acre)

Pressure:

275 kPa (40 psi)

Nozzles:

Flat Fan

How it Works:

Freedom is a systemic herbicide that is absorbed through the foliage and translocated to the growing points within plants. Growth stops soon after application of Freedom. After 1 to 3 weeks plants will discolour (yellowing, reddening, or purpling) starting with the newest leaves and spreading out from there eventually resulting in plant death.

Assure II is a systemic herbicide rapidly absorbed and readily translocated from the treated foliage to the root system and growing points. Symptoms in grasses are reduced growth and chlorosis (yellowing) of new leaves within 1 to 2 weeks of application, eventually resulting in plant death.

Effects of Growing Conditions:

For the effects of growing conditions on Assure II see Assure II (page 62).

Temporary crop yellowing or delay in flowering may occur with normal applications of Freedom Gold.

Freedom Gold applied to crops that have been under stress before application may result in crop injury. Stress conditions within 3 days of application may also result in crop injury.

Weeds under stress conditions at the time of application may not be adequately controlled.

Stress conditions include prolonged cool periods, frost, low fertility, drought, water-saturated soils, and disease or insect damage.

Injury symptoms can be crop discoloration (yellowing, purpling or reddening), stunting, or delay in flowering.

Tank Mixes:

Herbicides: None

Fertilizers: None

Insectcides: None

Restrictions:

Rainfall: Freedom - Several hours of dry weather are needed after application of Freedom to allow uptake by the plants. Broadleaf weed control may be reduced if rainfall occurs soon after application.

Assure II - Rainfall within one hour may reduce grass control.

Grazing: Must not be grazed or fed to livestock within 74 days of application.

Preharvest interval: Must not be harvested within 74 days of application.

Recropping Interval: Do not plant any crop other than wheat or barley for 30 days after application.

Aerial Application: Do not apply by air.

Storage: Store in closed original container in a dry area away from food or feed.

Environment: Do not apply within 15 m of water bodies, wetlands or sensitive plants.

Tank Cleaning:

Freedom can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Freedom should be flushed out immediately after Freedom is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with an ammonia rinse (1L of 3% ammonia per 100 L of water). All nozzles, screens and filters should be removed and cleaned separately during the cleaning process.

Hazard Rating:

Assure II:

Danger – Corrosive to eyes

Warning – Skin Irritant. Potential skin sensitizer.

This product contains 4 percent phenol that has been determined to be of toxicological concern.

Freedom:

Warning – Eye and Skin Irritant

Frontier

Herbicide Group – 15
(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

900 g/L dimethanamid formulated as an emulsifiable concentrate. Container size - 10 L.

Crops:

Corn (not sweet corn, popcorn, or corn grown for seed) and dry beans (white and kidney beans only).

Weeds:

Green foxtail.

Crop Stage:

Pre-plant incorporated (corn and beans) and pre-emergence (beans only).

Weed Stage:

Pre-emergence.

Rates:

Pre-plant incorporated treatments: Apply at 0.51 to 0.57 L/acre. Apply at the higher rate on fine-textured or high organic soils and for heavier anticipated weed problems.

Pre-emergence treatments:

	RATE (L/ACRE)		
SOIL TYPE	Less than 3 Percent Organic Matter	3 to 6 Percent Organic Matter	7 to 10 Percent Organic Matter
Coarse Textured Soils	0.45	0.45	0.51
Medium and Fine Textured Soils	0.45	0.51	0.57

Cost:

$17.82 to $22.57/acre (1999 suggested retail prices).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan. Use 16 mesh suction screen, 50 mesh elsewhere on sprayer.

Application and Incorporation:

For pre-plant incorporated treatments, apply Frontier as a broadcast treatment and incorporate using a harrow, rolling cultivator or other implement capable of giving uniform, shallow incorporation into the top 5 cm (2 inches) of soil within 7 days of planting. Avoid deeper incorporation or reduced weed control and/or crop injury may result. Immediate incorporation after application is not necessary.

Beans must be planted at least 4 cm (1.5 inches) deep or crop injury may occur.

How it Works:

Frontier is absorbed through shoots and roots of germinating weeds but primarily through the coleoptile in grassy weeds. Weeds are controlled before they emerge.

Effects of Growing Conditions:

Rainfall is required within 7 to 10 days of application to activate and move Frontier into the soil zone. If dry conditions persist, a shallow cultivation or the use of a rotary hoe is necessary to move the herbicide into moist soil and control weed escapes. Shallow tillage is important to minimize dilution of the herbicide. If drought conditions persist after pre-plant incorporated or pre-emergence applications, weed control may not be adequate.

Tank Mixes:

Herbicides: None registered.

Fertilizers: May be applied with a liquid fertilizer carrier. Test compatibility of Frontier with liquid fertilizer by mixing a small amount of herbicide with a proportional quantity of liquid fertilizer in a jar. May also be impregnated on dry bulk fertilizers for pre-plant incorporated treatments. A minimum of 90 kg/acre of dry bulk fertilizer should be applied. Do not impregnate Frontier on nitrate fertilizers, superphosphates or limestone.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall after application is important for good weed control.

Grazing: Do not graze or feed the treated corn crop within 40 days of application. Do not graze the treated bean crop or feed bean forage, hay or straw to livestock.

Recropping: Do not plant winter wheat within 120 days of application.

Aerial Application: Not registered.

Storage: Do not freeze. Must be stored under heated warehouse conditions.

Tank Cleaning:

The manufacturer does not provide information on tank cleaning. Generally, a mixture of water and household ammonia (1 L per 100 L of water) flushed twice through the tank and circulated through the lines and nozzles is an effective method of cleaning the sprayer tank.

Hazard Rating:

Caution Poison.

Warning Eye Irritant and Potential Skin Sensitizer.

Fusilade II

Herbicide Group – 1

(Refer to page 16)

Company:

Zeneca Agro

Formulation:

125 g/L of fluazifop-p-butyl formulated as an emusifiable concentrate. Container size - 8 L.

Rates and Weeds Controlled:

WEED	RATE (L/acre)	ACRES TREATED PER 8 L CONTAINER
Volunteer corn	0.243	33
Persian darnel, barnyard grass, volunteer spring wheat and spring barley	0.324	25
Wild oats, wild proso millet	0.405	20
Green and yellow foxtail (wild millet)	0.57	14
Quackgrass	0.81	10

Crops:

Potatoes and soybeans.

Crop Stage:

Potatoes tolerant at all growth stages. Do not apply later than the trifoliate leaf stage of soybeans.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Wild oats: 2 to 5 leaf stage. Other annual grassy weeds - 2 to 4 leaf stage and prior to tillering, except for 2 to 5 leaf stage for volunteer corn and 3 to 5 leaf stage of quackgrass. Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are controlled before tillering.

Cost:

$8.90 to $29.38/acre (1999 suggested retail price).

Water Volume:

5 to 20 gallons/acre (25 to 90 L/acre) water. Use higher water volumes for dense stands of crops/weeds.

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Standard flat fan nozzles.

How it Works:

Fusilade is a systemic herbicide that is absorbed through foliage and translocated from treated leaves to growing points within plants. Symptoms include yellowing of newest leaves within 1 to 3 days, which leads to browning and plant death 21 to 28 days after treatment.

Effects of Growing Conditions:

Reduced control will occur if grasses are under stress because of flooding, drought, low humidity, or excessively cool weather, particularly if grasses have tillered.

Tank Mixes:

Herbicides: Potatoes - Although Fusilade is registered for mixing with Sencor, the use of this tank mix may result in a loss of grass control.

Soybeans - Apply 0.16 L/acre Fusilade II with 0.22 L/acre Poast Ultra (184 g/L). Add the recommended amount of Merge.

Fertilizers: None registered.

Insecticides: None registered.

Apply broadleaf herbicides at least 3 days after application of Fusilade II.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours will reduce weed control.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Preharvest: Do not apply within 90 days of harvest.

Recropping: Do not sow cereals, corn or forage grasses in the year of treatment.

Storage: May be frozen.

Environment: Do not apply within 15 m of fish bearing waters and wildlife habitats.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make a recommendation.

Grass crops/cereals may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Experimental studies have shown that the active ingredient in this product may cause birth defects in laboratory animals. Women capable of bearing children should avoid contact with this product.

Fusion

Herbicide Group – 1
(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

One case of Fusion contains:

Component 1 - 80.5 g/L fenoxaprop-p-ethyl formulated as an emulsifiable concentrate. Container size - 3.7 L.

Component 2 - 125 g/L fluazifop-p-butyl formulated as an emulsifiable concentrate. Container size - 6.5 L.

Crops:

Canola, flax (DO NOT use on low linolenic acid varieties), lentils, mustard, and field peas.

Weeds:

Barnyard grass
Green foxtail
Persian darnel
Wild oats
Volunteer barley
Volunteer wheat

Crop Stage:

CROP	STAGING
Canola	Do not apply beyond the 5 leaf stage, 80 day preharvest interval
Flax (not for use on low linolenic varieties)	Tolerant at all growth stages, 80 day preharvest interval
Field peas	Tolerant at all growth stages, 75 day preharvest interval
Lentils	Do not apply beyond the 6 node stage, 82 day preharvest interval
Mustard	Do not apply beyond the 5 leaf stage, 70 day preharvest interval

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

1 to 6 leaf stage of annual grassy weeds. Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occur when weeds are controlled before tillering.

Cost:

$11.95/acre (1999 suggested retail price).

Rates:

Component 1 - 0.19 L/acre. Component 2 - 0.32 L/acre. One case treats 20 acres.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° stainless steel flat fan nozzles tilted forward at a 45° angle.

How it Works:

Fusion is a systemic herbicide that is translocated from treated leaves to growing points within plants. Symptoms include reduced leaf growth and chlorosis (yellowing) of the treated plants within 1 to 3 days. Plant death occurs 14 to 28 days after application.

Effects of Growing Conditions:

If daytime temperatures before or after application are very hot and dry with low humidity, reduced control may result. Do not apply to crop that is stressed (frost, heat, drought, water saturated soil, disease, etc.) as crop injury may result.

Tank Mixes:

Herbicides: Canola (including TTC) - Fusion may be mixed with Lontrel (0.23 L/acre).

B.napus or Argentine varieties only - Fusion may be mixed with Muster (0.008 to 0.012 kg/acre) for control of broadleaf weeds listed on Muster label.

Flax (NOT low linolenic acid varieties) - Fusion may be mixed with MCPA ester or amine (up to 0.34 L/acre - 500 g/L formulations). Fusion may also be mixed with Buctril M (0.40 L/acre). Under adverse conditions, tank mixes of Fusion and Buctril M or Fusion and MCPA may result in reduced grassy weed control.

Fertilizers: None registered.

Insecticides: None registered.

Note: An interval of 4 days prior to, or 4 days after application of Fusion is required before any other pesticide can be applied (unless registered in a Fusion tank mix).

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours may result in reduced control.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Recropping: No restrictions the year after application.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Environment: Do not apply within 15 m of a body of water or wetland area.

Tank Cleaning:

Before and after using Fusion, complete a thorough cleaning of the spray tank, lines and filter. This can be particularly important as the previously sprayed product may cause injury to the crop you intend to spray. Spray equipment should be triple-rinsed using a water/household ammonia solution. Scrubbing the tank is also highly recommended.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members and others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Experimental studies have shown that the active ingredient in Component 2 may cause birth defects in laboratory animals. Women capable of bearing children should avoid contact with this product.

glyphosate

Herbicide Group – 9

(Refer to page 16)

For Weed Control Prior to Crop Emergence in Summer fallow and Shelterbelts, Spot Treatment in Crops (After Harvest) and Control of Perennial Weeds.

Company:

Cheminova Canada (Glyfos)
Dow AgroSciences (Vantage, Vantage Plus)
Inter Ag (Victor)
Monsanto Canada Inc. (Roundup Dry, Roundup Original, Roundup Renew, Roundup Transorb)
Nufarm (Credit)
Van Waters and Rogers (Renegade)
Zeneca Agro (Touchdown 480, Touchdown 640)

Formulations:

Credit, Renegade, Roundup Original, Vantage, Victor: 356 g/L glyphosate acid present as an isopropylamine salt formulated as a solution (SN).

Container size - 2 x 10 L (all), 115 L (all), 450 L (Credit, Vantage) 750 L (Roundup Original)

Glyfos, Roundup Transorb, Vantage Plus: 360 g/L glyphosate acid present as an isopropylamine salt formulated as a solution (SN).

Container size - 2 x 10 L (all), 115 L (all), 450 L (Roundup Transorb, Vantage Plus), 750 L (Roundup Transorb), 1,000 L (Glyfos), 1200 L (Roundup Transorb)

Roundup Dry: 68.5% glyphosate acid present as a monoammonium salt granule (G). Container size - 10.4 kg.

Roundup Renew: 65% glyphosate acid present as a monoammonium salt granule (G). Container size - 11.2 kg.

Touchdown 480 & 640: 330 g/L (480) and 440 g/L (640) of glyphosate acid present as a trimethylsulfonium salt formulated as a solution (SN). Container size – 2 x 10 L (480), 450 L (640), and 1,000 L (640). Rely adjuvant (used with Touchdown 640) sold in 2 x 10 L jugs.

Crops:

- Pre-seeding burn-off or post-harvest stubble (all crops)*
- Spot treatment of perennial weeds in barley, corn, forage grasses and legumes, oats, soybeans, wheat, including crops for seed production.
- Summer fallow*
- Shelterbelts*

*Roundup Renew not registered for these uses.

Rates and Timing for Annual weed control prior to crop emergence or in summer-fallow

WEEDS CONTROLLED	WEED STAGE	PRODUCTS	RATE PER ACRE	SURFACTANT*
Grasses: Green foxtail, volunteer cereals, wild oat (light infestations) **Broadleaves:** lady's-thumb, stinkweed, volunteer canola (NOT including Roundup Ready varieties), wild mustard	Less than 3 inches (8 cm) high. Apply at the 1 to 3 leaf stage of wild oat.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480**, Vantage, Vantage Plus, Victor	0.30 L	0.14 L/acre
		Roundup Dry	0.16 kg	
		Touchdown 640**	0.23 L	Rely or Frigate (0.5% v/v)
Above weeds plus: **Grasses:** heavy infestations of wild oat **Broadleaves:** kochia, suppression of flixweed,	1 to 3 leaves for wild oat. Weeds 3 to 6 inches (8 to 15 cm).	Credit, Roundup Original, Glyfos, Renegade, Roundup, Touchdown 480**, Transorb, Vantage, Vantage Plus, Victor	0.40 L	0.14 L/acre
		Roundup Dry	0.21 kg	
		Touchdown 640**	0.30 L	Rely or Frigate (0.5% v/v)
Above weeds plus: **Grasses:** downy brome, Persian darnel, **Broadleaves:** Canada fleabane, common ragweed, flixweed, hemp-nettle, lamb's-quarters, narrow-leaved hawk's-beard, redroot pigweed, Russian thistle, volunteer flax, wild buckwheat	Canada fleabane, common ragweed-less than 3 inches (8 cm) high. Other weeds less than 6 inches (15 cm). Use high rate for narrow-leaved hawk's-beard 3 to 6 inches (8-15 cm) or wild buckwheat at the 3-4 leaf stage.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	0.51 to 0.77 L	Not required
		Roundup Dry	0.27 to 0.40 kg	
		Touchdown 640	0.38 to 0.57 L	Rely or Frigate (0.5% v/v)
Above weeds plus: **Grasses:** annual blue grass, crabgrass, **Broadleaves:** annual sow-thistle, kochia, prickly lettuce, shepherd's-purse	Less than 6 inches (15 cm) high	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	0.91 L	Not required
		Roundup Dry	0.48 kg	
		Touchdown 640	0.69 L	Rely or Frigate (0.5% v/v)
Above weeds	Greater than 6 inches (15 cm) high	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.42 L	Not required
		Roundup Dry	0.74 kg	
		Touchdown 640	1.05 L	Rely or Frigate (0.5% v/v)

* Unless otherwise specified, use one of the following surfactants: Agral 90, Agsurf, Companion, Enhance, Frigate or LI 700.
** Touchdown 480/640 are **NOT** registered for pre-emergent use at these rates and may be used for summerfallow only.

2. Quackgrass control prior to seeding or after harvest

QUACK GRASS STAGE	PRODUCT	RATE PER ACRE	SURFACTANT
Season long control of light to moderate infestation. Apply when quack grass is 8 inches (20 cm) tall and has 3 to 4 actively growing leaves. Apply spring or fall.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.0 L	Not required
	Roundup Dry	0.53 kg	
	Touchdown 640	0.77 L	Rely or Frigate (0.5% v/v)
Apply when quack grass has 3-4 new leaves for long term control of heavy infestations. Use high rate for sod-bound quack grass (left undisturbed for at least 2 years).	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.0 to 2.8 L	Not required
	Roundup Dry	0.53 to 1.5kg	
	Touchdown 640	0.77 to 2.1 L	Rely or Frigate (1% v/v) or Enhance at (0.20 L/acre)

Do not apply fall treatments if a hard frost has occurred (-5°C) or if plants are drought stressed. Spread straw to allow regrowth and good spray coverage.

Cultivation prior to application will result in reduced control. Do not cultivate between harvest and treatment when using fall applications. If using spring applications on fields which have been fall-tilled, delay application until the quack grass has reached the 4-5 leave stage. (This will occur 1 to 4 weeks later on fall-tilled fields than in undisturbed fields).

Cultivation after application usually will improve control of quack grass. Wait a minimum of 3 days after application before cultivating. If growing conditions are poor (cold or dry), particularly in the fall, waiting longer than 5 days may improve control.

3. Canada thistle control in summer-fallow, shelterbelts and post-harvest

WEED STAGING	PRODUCT	RATE PER ACRE
Bud stage or beyond. Allow at least 5 days after application before tillage.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.9-2.8 L
	Roundup Dry	1-1.5 kg
	Touchdown 640	1.5-2.1 L*
Rosettes at least 6 inches (15 cm) in diameter, treated in late summer, following tillage in spring and early summer (up to August 1). Allow thistles to regrow for 5 weeks following last tillage. Wait a minimum of 10 days after application before tillage. Treatment after a mild frost is possible if leaves are green and pliable and plants are actively growing.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.0 L
	Roundup Dry	0.53 kg
	Touchdown 640	0.77L*
Post-harvest stubble treatment. Allow 8-10 inches (20-25 cm) of new growth before application. Plants must be sprayed at least 2 weeks prior to killing frost. Straw should be removed or evenly spread to allow for proper regrowth and spray coverage.	Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor	1.9-2.8 L
	Roundup Dry	1.0-1.5 kg
	Touchdown 640	1.5-2.1 L*

* Add Rely or Frigate adjuvant at 0.5% v/v.

4. Dandelion control (other than preharvest)

PRODUCT	**Less than 6 inches (15 cm) diameter. Allow 3 or more days after treatment before tillage.**	**Greater than 6 inches (15 cm) diameter. Use higher rate when infestation is heavy.**	**Prior to seeding or after harvest. Use higher rate for weeds beyond 3 inches (8 cm) or for heavy infestation. Allow 7 or more days after treatment before tillage.**
Credit, Roundup Original, Roundup Transorb, Vantage, Vantage Plus	1.0 L/acre	1.5 – 2.0 L/acre	-
Roundup Dry	0.53 kg/acre	0.80-1.06 kg/acre	-
Touchdown 480	-	-	1.8-2.8 L/acre
Touchdown 640	-	-	1.3 - 2.1L/acre*

* Add Rely or Frigate adjuvant at 0.5% v/v.

5. Alfalfa Control (other than preharvest)

WEED STAGE	PRODUCT	RATE PER ACRE
Fall control of alfalfa in early bud to full bloom stage. Use high rate when alfalfa populations are high or when perennial grasses are present. Allow at least 3 days before cutting and at least 5 days before tillage. See tank mix section for minimum tillage or spring applications. Apply with 5-30 gal/acre (23-135 L/acre) water.	Credit, Renegade, Roundup Original, Roundup Transorb, Vantage, Vantage Plus	1.5 – 2.0 L
	Glyfos	2.8 to 4.8 L
	Roundup Dry	0.8 – 1.1 kg
Early bud to full bloom stage. Late summer or fall application only. Allow 3 days before intensive grazing or cutting.	Roundup Renew	1.13 kg
Prior to seeding or after harvest. Use higher rate for weeds beyond 3 inches (8 cm) in height or for heavy weed infestations. Wait 7 days after application for tillage. Apply in 5-30 gallons/acre (23-135 L/acre) water.	Touchdown 640	0.7 – 1.35 L*
	Touchdown 480	0.9 – 1.8 L

*Add Rely or Frigate adjuvant at 0.5% v/v.

6. Other perennial weeds

(Refer to individual product labels for detailed application information.)

	RATES IN UNITS PER ACRE		
	Milkweed Bud to full bloom.	**Toadflax**	**Foxtail Barley Seedling to heading***
Credit, Roundup Original, Roundup Transorb, Vantage, Vantage Plus	4.9 L	1.0 L (vegetative stage in summer fallow)	1.0-2.0 L
Renegade, Victor	4.9 L	1.0 L (vegetative stage in summer fallow)	0.4 L (suppression only) or 2.8 to 4.8 L to control
Glyfos, Touchdown 480	4.9 L	2.8 to 4.8 L (early bud stage)	0.4 L (suppression only) or 2.8 to 4.8 L to control
Roundup Dry	2.5 kg	0.53 kg (vegetative stage in summer fallow)	0.53-1.1 kg
Roundup Renew	1.6 to 2.7 kg	1.1 kg (Bud to full bloom stage)	1.1 kg
Touchdown 640	3.6 L**	2.1 to 3.6 L** (early bud stage)	0.30 L** (suppression) or 2.1 to 3.6 L** (control)

* Late fall applications may provide better control of established foxtail barley plants than spring applications.

** Add Rely or Frigate adjuvant at 1.0% v/v. Enhance adjuvant (0.20 L/acre) may be used for Touchdown 640 applications of 0.81 L/acre or greater.

7. **Patch treatments of perennial weeds in wheat, oat, barley, corn, soybean, forage legumes and forage grasses.** (refer to product label for detailed application instructions)

	RATES PER ACRE				
	Quack grass 8 in (20 cm) tall	**Canada thistle Bud or beyond**	**Field Bindweed Bloom or beyond**	**Milkweed Bud to bloom**	**Spot treatment rates for hand held equipment**
Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Vantage, Vantage Plus, Victor	1.0-2.8 L	1.9-2.8 L	2.8-4.9 L	4.9 L	1-2 L per 100 L water**
Roundup Dry	0.53-1.5 kg	1.0-1.5 kg	1.5-2.5 kg	2.5 kg	0.5-1.0 kg per 100 L water**
Roundup Renew	1.1 kg	1.1 kg	-	-	0.56 kg per 100 L water
Touchdown 480	1.0-2.8 L	1.9-2.8 L	2.8–4.9 L	4.9 L	Not registered
Touchdown 640 *	0.77-2.1 L	1.5-2.2 L	2.2-3.6 L	3.6 L	Not registered

*Add Rely or Frigate adjuvant at 1.0% v/v. Enhance at 0.2 L/acre.
**Use the low rate for quack grass and the high rate for all other perennials.

Tank Mixes:

	RATES PER ACRE			
	Pre-seeding cereals: Pardner (0.51 L)	**Alfalfa control in spring or fall: 2,4-D* (0.50 to 1.0 L)**	**Chem fallow: 2,4-D* (0.5 L) or Banvel II (0.12 L) or Pardner (0.51 L).**	**Canada thistle control in stubble or fallow: Banvel II (0.51 L)**
Touchdown 640	0.23-0.3 L	Not registered	0.23-0.3 L	0.57 L
Credit, Roundup Original, Roundup Transorb, Vantage, Vantage Plus	0.3-0.4 L	1.0-2.0 L	0.3-0.4 L	0.69 L
Glyfos, Renegade, Touchdown 480, Victor	0.3-0.4 L	Not registered	0.3-0.4 L	0.69 L
Roundup Dry	0.16-2.0 kg	0.53 – 1.1 kg	0.16-0.21 kg	0.36 kg

*** Both 500 g/L amine and equivalent ester formulations are registered tank mixes.**

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Cost

Credit - Not sold in 1999
Glyfos - $8.95 per L
Renegade - $8.15 per L
Roundup Original - $8.99 per L
Roundup Renew - Not sold in 1999
Roundup Transorb - $9.79 per L
Roundup Dry - $15.27 per kg
Touchdown 640 - $12.66 per L
Touchdown 480 - $9.20 per L
Vantage - Not sold in 1999
Vantage Plus - Not sold in 1999
Victor - $8.95 per L

(1999 recommended retail prices)

Water Volume

Do not use 'hard' or dirty water or weed control may be reduced. Using clean water at 5 to 10 gal/acre (23-45 L/acre) will provide acceptable weed control in most situations; use of the lower volume will improve control. Refer to specific weed control situations or labels for more information on water volumes and adjuvants.

Pressure

200 to 275 kPa (30 to 40 psi)

Nozzles

Flat fan

How it Works

Glyphosate is a nonselective, systemic herbicide which moves from treated foliage into roots and kills the entire plant. Visual effects include gradual wilting and yellowing of the plant which advance to complete browning of the above ground growth and deterioration of underground plant parts. Effects may not be visible for 7 to 10 days after application.

There is evidence to suggest that certain products provide more consistent weed control over a variety of conditions compared with other products. This may be a result of the type of adjuvants used in these products. Under optimum conditions for activity, the benefit from an improved adjuvant may be less pronounced.

Effects of Growing Conditions

Best results are achieved when temperatures are near 20°C and when weeds are actively growing.

Frost which kills more than 40% of the above ground tissue will reduce control.

Control will also be reduced if foliage is heavily covered with dust.

Restrictions:

Rainfall: Do not apply if rainfall is forecast for the time of application, as weed control may be reduced.

Grazing Interval: Do not graze or cut for hay, any crops treated with Touchdown 480/640. All portions of crops treated with other products may be fed to livestock.

Recropping Interval: No restrictions.

Aerial application: Do not apply by air.

Storage: May be stored below 0°C.

Equipment: Do not mix, store or apply this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.

Environment: Maintain a 15 m buffer zone from non-target areas

Tank Cleaning:

Wash equipment thoroughly with water immediately after use. When tank mixing with other products follow additional cleaning instructions provided for that product.

Do not clean equipment uphill from water bodies, dugouts or ditches, or near cropland or shelterbelts. Clean sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Touchdown 480/640- Warning Poison

All other products- Skin and Eye Irritant

glyphosate

For Pre-Harvest Perennial Weed Control

Herbicide Group – 9
(Refer to page 16)

Company:

Cheminova Canada (Glyfos)
Dow AgroSciences (Vantage, Vantage Plus)
Inter Ag (Victor)
Monsanto Canada Inc. (Roundup Dry, Roundup Original, Roundup Renew, Roundup Transorb)
Nufarm (Credit)
Van Waters and Rogers (Renegade)
Zeneca Agro (Touchdown 480, Touchdown 640)

Formulations:

Credit, Renegade, Roundup Original, Vantage, Victor: 356 g/L glyphosate acid present as the isopropylamine salt formulated as a solution. (SN). Container size - 2 x 10 L (all),115 L (all), 450 L (Credit, Vantage) 750 L (Roundup Original)

Glyfos, Roundup Transorb, Vantage Plus: 360 g/L glyphosate acid present as the isopropylamine salt formulated as a solution. (SN). Container size - 2 x 10 L (all), 115 L (all), 450 L (Roundup Transorb, Vantage Plus), 750 L (Roundup Transorb), 1000 L (Glyfos), 1200 L (Roundup Transorb)

Roundup Dry: 68.5% Glyphosate present as the monoammonium salt. granule (G). Container size - 10.4 kg.

Roundup Renew: 65% Glyphosate present as the monoammonium salt granule (G). Container size - 11.2 kg.

Touchdown 480 & 640: 330 g/L (480) and 440 g/L (640) of glyphosate acid present as a trimethylsulfonium salt formulated as a solution (SN). Container size – 2 x 10 L (480), 450 L (640) and 1,000 L (640). Rely adjuvant (used with Touchdown 640) sold in 2 x 10 L jugs.

Crops:

	barley, bean (dry), canola (rapeseed), lentil, field pea, soybean and wheat.	**flax**	**Flax (low linolenic acid varieties)**	**forages**	**oat**
Credit, Roundup Dry, Roundup Original, Roundup Transorb, Vantage, Vantage Plus	✓	✓	✓	✓	✓
Glyfos, Victor	✓	✓			
Renegade	✓	✓	✓	✓	
Roundup Renew	✓	✓	✓		✓
Touchdown 480/640	✓				

Do not apply to any crops grown for seed. May be applied to barley grown for malt. Contact malt barley buyers prior to application to confirm acceptance of glyphosate-treated barley.

Weeds Controlled:

Product	Quack grass 4-5 green leaves	Canada thistle and perennial sow-thistle at bud stage or beyond	Common milkweed at bud to bloom stage	Toadflax at bud to full bloom stage	Dandelion from rosette to full bloom stage
Credit, Renegade Roundup Original, Roundup Transorb, Vantage, Vantage Plus	✓	✓	✓	✓	✓
Glyfos, Touchdown 480/640 Victor	✓	✓	✓		
Roundup Dry	✓	✓	✓	✓	✓
Roundup Renew	✓	✓	✓	✓	✓

Crop Stage:

Apply to crops (except forage) when grain moisture is less than 30%. The following chart lists visual symptoms that can be used as guidelines to when 30% grain moisture has been reached.

CROP*	VISUAL SYMPTOMS
Wheat/Barley/Oat	Hard dough stage – a thumbnail impression remains on seed.
Canola	Pods are green to yellow and most seeds are yellow to brown.
Flax (including low linolenic acid varieties)	Majority (75 to 80% of bolls) are brown.
Lentil	Lowermost pods (bottom 15%) are brown and rattle when shaken.
Pea	Majority (75 to 80%) of pods are brown.
Soybean	Stems are green to brown in colour and pod tissue is brown and dry in appearance (80 to 90% leaf drop).
Dry Bean	Stems are green to brown in colour and pods are mature (yellow to brown) and 80 to 90% of the original leaves have dropped.
Forage	3 to 7 days prior to the last cut before rotation or forage renovation. **Do not apply to forage stands that are to be maintained.**

*See the crops section for a guide to the products registered on each crop

Rates:

Credit, Glyfos, Renegade, Roundup Original, Roundup Transorb, Touchdown 480, Vantage, Vantage Plus, Victor – 1.0 L/acre

Roundup Dry – 0.53 kg/acre

Roundup Renew – 0.56 kg/acre

Touchdown 640 – 0.77 L/acre

Cost:

Credit – Not sold in 1999
Glyfos - $8.95 per L
Renegade - $8.15 per L
Roundup Dry - $15.27 per kg
Roundup Original - $8.99 per L
Roundup Renew – Not sold in 1999
Roundup Transorb – $9.79 per L
Touchdown 640 - $12.66 per L
Touchdown 480 - $9.20 per L
Vantage – Not sold in 1999
Vantage Plus – Not sold in 1999
Victor - $8.95 per L
(1999 recommended retail prices)

Water Volume:

Do not use 'hard' or dirty water or weed control may be reduced. Use clean water at 5 to 10 gal/acre (23 to 45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi)

Nozzles:

Flat fan

How it Works:

Glyphosate is a nonselective, systemic herbicide which moves from treated foliage into roots and kills the entire plant. Visual effects include gradual wilting and yellowing of the plant which advance to complete browning of the above ground growth and deterioration of underground plant parts. Effects may not be visible for 7 to 10 days after application.

There is evidence to suggest that certain products provide more consistent weed control over a variety of conditions compared with other products. This may be a result of the type of adjuvants used in these products. Under optimum conditions for activity, the benefit from an improved adjuvant may be less pronounced.

Effects of Growing Conditions:

Best results are achieved when temperatures are near 20°C and when weeds are actively growing. Frost which kills more than 40% of the above ground tissue will reduce control. Control will also be reduced if foliage is heavily covered with dust.

Restrictions:

Rainfall: Do not apply if rainfall is forecast for the time of application, as weed control may be reduced.

Grazing Interval: Do not graze or cut for hay, any crops treated with Touchdown 480/640. All portions of crops treated with other products may be fed to livestock.

Recropping Interval: No restrictions.

Aerial application: Do not apply by air.

Storage: May be stored below 0°C.

Equipment: Do not mix, store or apply this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.

Environment: Maintain a 15 m buffer zone from non-target areas

Tank Cleaning:

Wash equipment thoroughly with water immediately after use. When tank mixing with other products follow additional cleaning instructions provided for that product.

Do not clean equipment uphill from water bodies, dugouts or ditches, or near cropland or shelterbelts. Clean sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Touchdown 480/640- Warning Poison
All other products - Skin and Eye Irritant

glyphosate

For use in Roundup Ready Crops

Herbicide Group – 9
(Refer to page 16)

Company:

Monsanto Canada Inc.

Formulations:

Roundup Original: 356 g/L glyphosate acid present as the isopropylamine salt formulated as a solution (SN).

Container size - 2 x 10 L, 115 L and 750L.

Roundup Transorb: 360 g/L glyphosate acid present as the isopropylamine salt formulated as a solution (SN).

Container sizes - 2 x 10 L, 115 L, 450 L, 750 L and 1,200 L.

Crops:

Roundup Ready canola

Roundup Ready field corn (Roundup Transorb only)

Crop Stage:

Canola - cotyledon to 6 leaf stage. Temporary yellowing may occur if applied at the 4-6 leaf stage of the crop.

Corn - 1-8 leaf stage

Weed Controlled, Staging and Rates in Roundup Ready Canola:

Apply 0.33 to 0.5 L/acre to control:

Annual grasses: barnyard grass, green foxtail, volunteer cereals, wild oat

Annual broadleaves: annual smartweed spp.**, chickweed, corn spurry, cow cockle*, hemp-nettle, kochia, lamb's-quarters, narrow-leaved hawk's-beard, night-flowering catchfly*, redroot pigweed, round-leaved mallow (suppression), Russian thistle, shepherd's-purse*, stinkweed, stork's-bill, volunteer canola (except Roundup Ready varieties), wild mustard, wild tomato.

* Low rates can be used only up to the 3 leaf stage of the crop otherwise use high rate.

**Low rates can be used only when annual smartweed is in 4 - 6 leaf stage.

Apply 0.50 L/acre to control:
cleavers, flixweed, wild buckwheat
or for suppression of Canada thistle, dandelion, perennial sow-thistle, and season long control of quack grass.

A second application of 0.5 L/acre may be made to provide season long control of Canada thistle, foxtail barley, and perennial sow-thistle, as long as the application is made within the above stage recommendations.

Weeds Controlled, Staging and Rates in Roundup Ready Corn:

Apply 1.0 L/acre to control:

Grasses: barnyard grass, crabgrass spp., foxtail (green, yellow, giant), quack grass.

Broadleaves: cocklebur, common ragweed, lady's-thumb, lamb's-quarters, pigweed (smooth, redroot), smartweed spp., eastern-black flowering nightshade, wild mustard, wild buckwheat, velvetleaf.

A second application at 1.0 L/acre may be made to control late flushes within the appropriate crop stage.

To maximize weed control and crop yield, apply when weeds are less than 10 inches (25 cm) high

Cost:

Roundup Original - $8.99 per L
Roundup Transorb - $9.79 per L
(1999 recommended retail prices)

Water Volume:

Do not use 'hard' or dirty water or weed control may be reduced. Using clean water at 5 to 10 gal/acre (23-45 L/acre), will provide acceptable weed control in most situations; use of the lower volume will improve control.

Pressure:

200 to 275 kPa (30 to 40 psi)

Nozzles:

Flat fan

How it Works:

Glyphosate is a nonselective, systemic herbicide which moves from treated foliage into roots and kills the entire plant. Visual effects include gradual wilting and yellowing of the plant which advance to complete browning of the above ground growth and deterioration of underground plant parts. Effects may not be visible for 7 to 10 days after application.

There is evidence to suggest that certain products provide more consistent weed control over a variety of conditions compared with other products. This may be a result of the type of adjuvants used in these products. Under optimum conditions for activity, the benefit from an improved adjuvant may be less pronounced.

Effects of Growing Conditions:

Best results are achieved when temperatures are near 20°C and when weeds are actively growing. Frost which kills more than 40% of the above ground tissue will reduce control. Control will also be reduced if foliage is heavily covered with dust.

Tank mixes:

In Roundup Ready Canola varieties, Roundup Original or Roundup Transorb at 0.5 L/acre may be tank mixed with Lontrel at 0.112 L/acre for improved control of Canada thistle and wild buckwheat.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Do not apply if rainfall is forecast for the time of application, as weed control may be reduced.

Grazing Interval: All portions of crops treated may be fed to livestock.

Recropping Interval: No restrictions.

Aerial application: Do not apply by air.

Storage: May be stored below 0°C.

Equipment: Do not mix, store or apply this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.

Environment: Maintain a 15 m buffer zone from non-target areas

Tank Cleaning:

Wash equipment thoroughly with water immediately after use. When tank mixing with other products follow additional cleaning instructions provided for that product.

Do not clean equipment uphill from water bodies, dugouts or ditches, or near cropland or shelterbelts. Clean sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Skin and Eye Irritant

Gramoxone

Herbicide Group – 22

(Refer to page 16)

Company:

Zeneca Agro

Formulation:

200 g/L paraquat.

Container size - 5 L, 1 L.

Crops:

Stale seedbed - Non-selective weed control applied prior to crop emergence in beans, corn, potatoes, peas, soybeans.

Non-selective weed control applied as a directed spray between rows in row crops.

Control of weed seedlings in established alfalfa and bird's-foot trefoil for hay applied after first cut.

Control of weed seedlings in bird's-foot trefoil for seed.

Non-selective weed control applied as a directed spray in and around shelterbelt trees.

Weeds:

Annual weed burn-off.

Crop Stage:

Stale seedbed - apply 3 days prior to crop emergence.

Established alfalfa and bird's-foot trefoil for hay - apply 5 days after first cut.

Bird's-foot trefoil for seed - apply in spring when bird's-foot trefoil shoots are 3 to 6 inches (7.5 to 15 cm) long.

Shelterbelts - avoid contact with foliage.

Weed Stage:

Best control when weeds are less than 2 inches (5 cm) in height or diameter.

Cost:

$21.06 to $42.13/acre (1999 suggested retail price).

Rates:

If weeds are less than 2 inches (5 cm) in height, apply 1.1 L/acre (one 5 L jug treats 4.5 acres). If weeds are taller than 2 inches (5 cm), increase the rate of Gramoxone to 2.2 L/acre (one 5 L jug treats 2.2 acres).

Water Volumes:

Use 30 to 110 gallons/acre (135 to 500 L/acre). Use the higher water volumes within the range if weed growth is dense.

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

How it Works:

Gramoxone is a contact herbicide that is absorbed into green leaves and stems where it causes rapid bleaching of green tissue. Plant wilting and desiccation begins within several hours of application, with complete plant death occurring in 1 to 3 days.

Effects of Growing Conditions:

Best results on cloudy days or just prior to darkness.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Within 1 hour will reduce weed control.

Grazing: Do not graze or harvest treated foliage. Regrowth from treated alfalfa or bird's-foot trefoil may be fed to livestock.

Recropping: None.

Aerial Application: No restrictions on label, however, since this product requires a minimum of 30 gallons/acre of water, applications by air are impractical.

Storage: Do not freeze.

Tank Cleaning:

When finished spraying Gramoxone, rinse the sprayer out with clean water. Run through pump, lines and nozzles. Drain tank by spraying out on an untreated portion of a crop on which the product is registered, or by spraying on uncropped land. Refill sprayer with water and Agral 90, Agsurf at 0.6 L per 1,000 L spray solution. Run the solution through lines and boom. Spray out, then refill with clean water. Leave equipment standing overnight, then drain water out.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Poison

Gramoxone PDQ

Herbicide Group – 22

(Refer to page 16)

Company:

Zeneca Agro

Formulation:

132 g/L paraquat ion present as the dichloride salt.

66 g/L diquat ion present as the dibromide salt.

Container size - 10 L.

Crops:

Gramoxone PDQ can be applied prior to, or immediately following the seeding of the these crops:

barley, canaryseed, canola, corn, dry common beans, field peas, flax (including low linolenic acid varieties), lentils, mustard, oats, potatoes, rye, soybeans, sunflowers, triticale, wheat, a variety of vegetable crops and vegetation control around tree and vine fruit crops.

Gramoxone PDQ is inactivated upon contact with the soil so it has no residual effect in the soil.

Weeds:

For control of annual weed seedlings, as well as top-growth control of perennial weeds.

Crop Stage:

Apply before or after seeding, but prior to crop emergence to control emerged weeds in conventional, minimum and zero tillage production systems and when using stale seedbed production techniques. **Gramoxone PDQ can severely damage emerged plants! Not for use in emerged crop.**

Rates and Weed Stages:

Apply 2.0 to 4.0 L/ha (0.8 to 1.6 L/acre). For spring control of winter annuals, or when weed growth is dense and weeds are greater than 10cm in height, use at least 3.0 L/ha (1.2 L/acre).

Cost:

$8.00 to $16.00 per acre

(1999 suggested retail price).

Water volume:

Apply in at least 10 gal/acre (45 L/acre) by ground sprayer.

Pressure:

200 to 275 kPa (30 to 40 psi)

Nozzles:

Flat fan

How it Works:

Gramoxone PDQ is a contact herbicide that is rapidly absorbed by the treated foliage of the plants. Through a series of chemical reactions in the plant, the active ingredients are transformed into compounds that destroy the cell membranes, allowing cell fluids to leak out. Wilting and desiccation of the plant begins within hours of application.

Effects of Growing Conditions:

Best results if applied on cloudy days or just prior to darkness.

Tank Mixes:

Herbicides: None registered.

Fertilizers: Clear liquid nitrogen or completely clear liquid fertilizers may also be used as a carrier for Gramoxone PDQ.

Insecticides: None registered.

Restrictions:

Rainfall: Rainfall shortly after application normally will not reduce effectiveness.

Grazing: Do not graze or harvest field crops within 30 days of treatment.

Recropping: None

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Buffer zones: Maintain a buffer zone of 20 meters between the last spray swath and the edge of sensitive terrestrial areas to protect non-target plants. Maintain a buffer of 45 m to the edge of sensitive aquatic areas to protect non-target aquatic plants and algae.

Tank Cleaning:

Wash equipment thoroughly after spraying. Use a wetting agent (Agral 90, Agsurf at 0.6 L per 1,000 L of water), flush and spray out, then thoroughly rinse with clean water. When possible, the equipment should be filled with clean water and left overnight. Spray out before storing equipment or using for other materials.

Hazard Rating:

Warning - Poison

Danger - Corrosive to Eyes

Danger - Skin Irritant.

Harmony Total

Herbicide Group – 1, 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

Refine Extra: 50% thifensulfuron methyl, 25% tribenuron methyl; formulated as a water dispersible granule. Container size: 4 x 80 g water soluble pouches (320 g total).

Horizon: 240g/ L clodinafop-propargyl (plus safener) formulated as an emulsifiable concentrate. Container size: Horizon 1 x 3.7 L + 2 x 6.4 L Score.

Crop:

Spring wheat (including durum)

Weeds:

Chickweed
Corn spurry
Cow cockle
Flixweed
Green foxtail
Green smartweed
Hemp-nettle
Kochia
Lady's-thumb
Lamb's-quarters
Redroot pigweed
Russian thistle)
Shepherd's-purse
Stinkweed
Tartary buckwheat
Volunteer rapeseed/canola
(not including Smart canola)
Wild buckwheat
Wild mustard
Wild oat

Weeds Suppressed

Canada thistle, sow-thistle, round-leaved mallow, cleavers, scentless chamomile, stork's-bill, toadflax (less than 15 cm tall)

Crop Stage:

2 leaf up to emergence of flag leaf

Weed Stage:

Wild oat - 1 to 6 leaves, prior to the 4th tiller

Green foxtail - 1 to 5 leaf, prior to 3rd tiller emergence.

Wild buckwheat - 1 to 3 leaves

Cleavers - 1 to 3 whorls

Stork's-bill, round-leaved mallow - 2-6 leaves

Canada thistle, perennial sow-thistle - under 6" tall, prior to budding

Chickweed - 1 to 6 leaf

Toadflax - less than 6" tall

For optimum control apply before the annual grasses tiller. Harmony Total will also control or suppress the broadleaf weeds listed for REFINE EXTRA® alone at 0.008 kg/acre.

Cost:

$20.75/acre

(1999 suggested retail price)

Rates:

Wild oats - 0.008 kg/acre of Refine Extra + 0.093 L/acre Horizon + Score 0.8 L per 100 L of spray solution. One case treats 40 acres (16 ha).

Refer to the product label for complete mixing instructions for this product and its mixecan be found on page 26.

Water Volume:

5 to 10 gallons per acre (23 to 45 L/acre)

Pressure:

275 kpa (40 psi)

Nozzles:

Flat fan nozzles with 50 mesh line strainers and screens.

How it Works:

Harmony Total is absorbed by the foliage and rapidly translocated to the growing points. Inhibits cell elongation in broadleaf weeds. Broadleaf weed growth stops soon after application. Discoloration (yellowing, purpling, reddening) of weeds becomes noticeable one to three weeks after application depending on growing conditions and weed species. Leaves and growing points of grass weeds turn yellow within one to three weeks of application. Browning and death occur three to five weeks after application.

Effects of Growing Conditions:

Do not apply to crop stressed by conditions such as frost, low fertility, drought, flooding, disease or insect damage as crop injury may result.

Tank Mixes:

Herbicides: MCPA Ester (0.38 to 0.45 L/acre of 500 g/L formulation).

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall within 30 minutes will reduce grass control. Rainfall within 4 hours will reduce broadleaf control.

Grazing: Do not graze or harvest treated crops for forage within 3 days of application.

Recropping: No restrictions the year after treatment.

Aerial application: Do not apply by air.

Storage: Store in a cool, dry place. May be frozen.

Tank Cleaning:

To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Ammonia must be used to deactivate Harmony Total when cleaning.

Drain tank and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for a minimum of 5 minutes. Fill the tank with water while adding 1 litre of household ammonia (minimum 3 percent ammonia) for every 100 L of water. Flush hoses, boom and nozzles with the cleaning solution, then add more water to completely fill the tank. Circulate for 15 minutes. Again flush hoses, boom and nozzles with the cleaning solution, and then drain the tank. Remove and clean the nozzles and screens separately in a bucket containing a 1 percent solution of ammonia in water (1 L of 3 percent ammonia per 100 L water). If the spray equipment is to be used to spray crops other than cereals, repeat the above process and thoroughly wash the spray mixture from the outside of the spray tank and the boom. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing the water through the hoses and boom. Prior to using the sprayer again, flush the tank, boom and hoses for 5 minutes with fresh water.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent or walk.

Hazard Rating:

Eye and skin irritants.

Heritage 5G (Not for use in Manitoba)

Herbicide Group – 3
(Refer to page 16)

Company:

Dow AgroSciences

Formulation:

5 percent trifluralin granule. Container size - 25 kg bag or 725 kg returnable bulk bag.

Crops:

Spring wheat (including durum) in the brown soil zone of Saskatchewan. Not for use in Manitoba.

Weeds:

Fallow Year:
Green foxtail
Wild oats
Persian darnel
Barnyard grass
Russian thistle
Wild buckwheat
Cow cockle
Lamb's-quarters
Redroot pigweed

Crop Year:
Green foxtail
Wild oats[1]
Lamb's-quarters
Wild buckwheat[1]

[1] Suppression only

Crop Stage:

Apply to summerfallow in May, June, or July for weed control during both years of a fallow-wheat rotation or in the fall (September or October) or spring prior to wheat seeding. Do not apply to stubble when the previous crop was treated with another trifluralin product (Treflan, Heritage, Advance, Rival or Bonanza). This includes application the previous summer or fall. Do not apply Heritage to stubble or fallow when the previous year's crop was an oilseed, barley or pulse crop treated with a deep incorporated, spring or fall applied trifluralin product.

Weed Stage:

Pre-emergence. Will not control established weeds.

Cost:

$7.83 to $15.66/acre (1999 suggested retail price).

Rates:

Date of Application	RATE (KG/ACRE)	
	1-3% Organic Matter	4-8% Organic Matter
May	7.7	9
June	6.5	7.7
July	5.3	6.5
	2-8% Organic Matter	
September-October	4.5[1]	
Spring (April or May, in the year of seeding)	4.5[1]	

[1] Control of green foxtail only.

During the fallow year, susceptible weeds may not be fully controlled until after the second fallow operation has established a uniform layer of soil treated with Heritage. Control of wild oats in the crop year may be variable depending on wild oat population as well as soil and climatic conditions. Some wild buckwheat may escape but its growth will be retarded and result in limited competition to the wheat crop.

Application:

Do not apply to sandy soils with less than 1 percent organic matter. Application to severely eroded knolls is not recommended. Do not apply to wet soils, soils in poor working condition, soils which contain more than 8 percent organic matter, or soils subject to prolonged periods of flooding.

Heritage may be applied to standing or pre-worked stubble, provided trash or green growth does not interfere with cultivation (prevent soil mixing).

Over-application caused by overlapping, improper calibration or non uniform application may result in reduced crop stand, delayed development or reduced yields.

Close applicator lid after filling to avoid prolonged exposure to direct sunlight.

Incorporation:

May - July: Apply Heritage to the soil surface and incorporate immediately, in the same operation if possible. Do not delay incorporation more than 24 hours after application. Use a deep tillage cultivator, field cultivator or disc implement set to work 2 to 3 inches (5 to 8 cm) deep, and operating at 8 to 10 km/hr. A second incorporation at the same depth and at an angle to the first should be done when weed growth requires it. Wait at least one week before making the second incorporation. After completing two fallow incorporations, additional operations with a rod weeder, shallow tillage or fall 2,4-D application may be required to control remaining weed growth.

September - October: Apply Heritage after harvest until freeze-up and incorporate immediately, in the same operation if possible with a deep tillage cultivator, field cultivator or disc implement set to work 2 to 3 inches (5 to 8 cm) deep. Do not delay incorporation more than 24 hours after application. A second incorporation may be done in the fall a minimum of 3 days later. Alternatively, in order to conserve trash cover throughout the winter, the second incorporation can be completed in the spring at the same depth and at an angle to the first incorporation. When both incorporations take place in the fall, shallow spring tillage should be completed in the spring. If a discer or air seeder is used for seeding, separate spring tillage may not be necessary.

Heritage should not be incorporated when soil is crusted, lumpy or too wet for good mixing action. Fall application is not recommended on soils where a lack of trash cover combined with the required incorporation would leave the soil vulnerable to erosion.

Spring (April - May): Apply Heritage and incorporate immediately, in the same operation if possible. Do not delay the first incorporation more than 24 hours after application. The second incorporation must be delayed a minimum of 3 days following the first incorporation. When applied to cold soils, wait 14 days before making second incorporation. The second incorporation should be done at an angle to the first incorporation, and at the same depth. If a discer or air seeder is used for seeding, the seeding operation can be used as the second incorporation.

Seeding:

Allow soil to warm before seeding to reduce risk of injury to crop. Place seed 1.25 to 2.5 inches (3 to 6 cm) deep. If spring seedbed preparation is required, set cultivator 2 inches (5 cm) deep. To reduce the risk of wheat injury, use good quality seed and agronomic practices which will promote good growing conditions. Avoid deep seeding, loose seedbeds and seeding into cold soils. If extended dry periods were present after a fallow application, a 10 percent increase in seeding rate is recommended.

How it Works:

Heritage controls susceptible weeds by killing seedlings as they germinate. If the shoot escapes the soil surface, the roots continue to be inhibited, resulting in a less competitive plant. Heritage does not control established weeds.

Effects of Growing Conditions:

Prolonged drought conditions after a May-July application to fallow may result in higher levels of trifluralin in the soil at the time of seeding. If conditions are not conducive to rapid emergence and growth of the wheat crop (for example cold or dry soil conditions) injury can occur.

Restrictions:

Rainfall: Once the product is incorporated into the soil, rainfall has no effect.

Grazing: Do not graze or cut for hay; insufficient data to support such use.

Recropping: Oats, canaryseed and small seeded forage grasses such as timothy and creeping red fescue should not be grown in rotation following a Heritage treated crop.

Aerial application: Do not apply by air.

Storage: Store in a cool, dry location, out of direct sunlight.

Hazard Rating:

Danger Poison.

Hoe-Grass 284

Herbicide Group – 1

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

284 g/L diclofop-methyl formulated as an emulsifiable concentrate.

Container size - 10 L.

Crops:

- Barley
- Dry beans (white, black and pinto)
- Fababeans
- Flax
- Lentils
- Mustard
- Potatoes
- Peas (field and processing)
- Rapeseed (canola)
- Rye (spring and fall)
- Soybeans
- Sunflowers (except Corona)
- Tame buckwheat
- Triticale
- Wheat (spring, durum and winter)
- Seedling Forage grasses (intermediate wheatgrass, Russian wild ryegrass, creeping red fescue, crested wheatgrass and bromegrass)
- Seedling Forage legumes (alfalfa, red clover and sweet clover; seedling sainfoin and alsike clover for seed production only)

Weeds:

- Barnyard grass
- Green foxtail
- Persian darnel
- Volunteer corn
- Wild oats
- Yellow foxtail

Crop Stage:

Barley - 1 to 4 leaf stage of the crop and prior to tillering.

Other crops - no leaf stage restrictions but do not apply within 60 days of harvest.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Wild oats, green and yellow foxtail, barnyard grass - 1 to 4 leaf stage. Although registered for application up to the 5 leaf stage of wild oats, results at this stage are inconsistent and this use is not recommended. For best results, apply when the majority of weeds are in the 2 to 3 leaf stage.

Persian darnel - 1 to 3 leaf stage.

Volunteer corn - 6 to 10 inches (15 to 25 cm) in height.

Cost:

$13.56 to $19.07/acre (1999 suggested retail price).

Water Volume:

Ground equipment - 10 gallons/acre (45 L/acre).

Aerial equipment - A minimum of 3 gallons/acre (14 L/acre).

Pressure:

Ground equipment - 275 kPa (40 psi).

Aircraft - 300 kPa (45 psi).

Nozzles:

Ground equipment - 80° or 110° stainless steel flat fan nozzles tilted forward at an angle of 45°.

How it Works:

Hoe-Grass 284 is a systemic herbicide that is translocated from treated leaves to growing points within plants. Chlorosis (yellowing) appears in 2 or 3 days and plant death occurs in about 2 weeks.

Effects of Growing Conditions:

Application under hot (above 28°C) or droughty conditions will result in reduced weed control. Hoe-Grass 284 provides optimum results under cool, moist conditions.

Under certain environmental conditions, yellow blotches may appear on barley leaves. Under certain environmental conditions, especially hot, humid weather, leaf scorch on cereals and leaf cupping and burn on broadleaf crops may result from Hoe-Grass 284 application.

Rates:

CROP	RATE (L/ACRE)	ACRES TREATED PER 10 L CONTAINER
Dry beans (white, black, pinto), fababeans, potatoes, soybeans and sugar beets	1.42	7
Other labelled crops	1.01 - 1.13	10 - 7.75

Herbicide Tank Mix Table:

CROP	HERBICIDE TANK MIX
Wheat (spring and durum), flax, barley. Use 1.13 L/acre of Hoe-Grass 284.	Pardner - 0.405 L/acre. Will not control wild mustard beyond the 3 leaf stage.
Rapeseed (canola) including Triazine tolerant (TTC) varieties. Use 1.13 L/acre of Hoe-Grass 284.	Lontrel - 0.17 L/acre.

Tank Mixes:

Herbicides: See table.

Fertilizers: None registered.

Insecticides: Hoe-Grass 284 may be tank mixed with Decis 5EC on wheat (spring, winter and durum), barley, flax, rapeseed (canola), mustard and potatoes. See Decis 5EC label for recommended rates and cautions.

Do not tank mix Hoe-Grass 284 with any pesticide for aerial application. Do not tank mix Hoe-Grass 284 under stress conditions such as prolonged periods of drought, excessively hot temperatures or low humidity as reduced control of grassy weeds may result. Apply other pesticides, fertilizers or chemical additives at least 4 days after application of Hoe-Grass 284.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour of application will reduce control.

Grazing: Do not graze or cut for feed treated cereal crops prior to crop maturity. Do not feed treated forages in the year of treatment. Do not feed sainfoin or alsike clover for the life of the stand.

Recropping: No restrictions the year after application.

Aerial Application: May be applied by aircraft for weed control in wheat, barley, flax or rapeseed (canola) only. Apply in a minimum 3 gallons/acre (15 L/acre) water volume. Do not tank mix with any other products.

Storage: Do not freeze. Shake well before using.

Tank Cleaning:

Immediately after spraying Hoe-Grass 284, triple rinse with 1 L of 3 percent ammonia per 100 L water. Circulate the solution through lines and nozzles. Flush sprayer system with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Corrosive

Hoe-Grass II

Herbicide Group – 1,6

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

230 g/L diclofop methyl and 80 g/L bromoxynil formulated as an emulsifiable concentrate.

Container size - 10 L.

Crops:

Wheat (spring and durum), barley, spring rye, triticale, flax, seedling forage grasses grown for seed (bromegrass, creeping red fescue, Russian wild ryegrass, crested wheatgrass, intermediate wheatgrass).

Weeds:

Barnyard grass
Common groundsel
Cow cockle
Green foxtail
Green smartweed
Kochia
Knawel
Lady's-thumb
Lamb's-quarters
Night-flowering catchfly
Persian darnel
Redroot pigweed
Russian thistle
Scentless chamomile
Stinkweed
Tartary buckwheat
Volunteer corn
Wild buckwheat
Wild mustard
Wild oats
Yellow foxtail

Weed Stage:

ANNUAL WEEDS	TIME OF APPLICATION
Wild oats, green and yellow foxtail, barnyard grass	1 to 4 leaf
Persian darnel	1 to 3 leaf
Volunteer corn	6 to 10 inches (15 to 25 cm in height)
Russian thistle	Seedling to 2 inches (5 cm) in height
Other labelled broadleaf weeds	seedling to early 4 leaf stage

Best results are obtained from early applications (2 to 3 leaf stage of grassy and broadleaf weeds).

Crop Stage:

Wheat, triticale and spring rye - no leaf stage restrictions, but do not apply within 60 days of harvest.

Barley - 1 to 4 leaf stage and before tillering.

Flax - 2 to 4 inches (5 to 10 cm) in height.

Seedling forage grasses - 2 to 5 leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

$19.39/acre (1999 suggested retail price).

Rates:

1.4 L/acre (one container treats 7 acres).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° stainless steel flat fan nozzles tilted forward at an angle of 45°.

How it Works:

For grassy weeds, Hoe-Grass II acts as a systemic herbicide that is translocated from treated leaves to growing points within plants. Chlorosis (yellowing) appears in 2 or 3 days and plant death occurs in about 2 weeks. For broadleaf weeds, weed control occurs through contact action. Weeds turn brown and die within 3 to 5 days. Thorough coverage is important for good results.

Effects of Growing Conditions:

Applications of Hoe-Grass II during periods of crop stress, when plants are not actively growing because of hot temperatures (above 28°C) or under very dry conditions or low humidity, may result in substantially reduced weed control. Under certain environmental conditions yellow blotches may appear on crop leaves. During periods of stress (above 28°C) or high humidity, flax may show leaf burn, retarded growth and a slight delay in maturity. Avoid spraying flax under these conditions.

Tank Mixes:

Herbicides: Hoe-Grass II may be tank mixed with MCPA amine (500 g/L) at the reduced rate of 0.028 L/acre to improve wild mustard control in wheat (spring and durum), barley (except Norbert, Glenn, Betzes or Klages), spring rye and triticale. Exceeding the recommended rate of MCPA amine 500 will result in a severe reduction in grassy weed control. Although registered, this tank mix is not recommended because of inconsistent results and possible antagonism of grassy weed control.

Fertilizers: None registered.

Insecticides: Hoe-Grass II may be tank mixed with Decis 5EC on wheat (spring and durum), barley and flax.

Allow a 4 day interval between application of Hoe-Grass II and other herbicides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour will reduce control.

Grazing: Do not graze treated crops or cut for hay.

Recropping: No restrictions the year after application.

Aerial Application: Do not apply by air.

Storage: Do not freeze. Shake well before using.

Preharvest: Do not apply within 60 days of harvest.

Tank Cleaning:

Immediately after spraying Hoe-Grass II, run clean water/household ammonia through the tank, pump and lines. Circulate the solution through lines and nozzles. Flush sprayer system with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Horizon

Herbicide Group – 1
(Refer to page 16)

Company:

Novartis Crop Protection

Formulation:

240 g/L clodinafop-propargyl formulated as an emulsifiable concentrate.

1 case contains 4.7 L of Horizon plus 2 x 8 L containers of Score adjuvant.

Crops:

Spring wheat (including durum).

Weeds:

Wild oats, green and yellow foxtail, persian darnel, volunteer oats, barnyard grass, volunteer canaryseed.

Crop Stage:

Apply before the emergence of the 4th tiller. When tank mixing, check broadleaf product description for additional restrictions.

Weed Stage:

Wild oats - 1 to 6 leaf stage, maximum 3 tillers.

Green and yellow foxtail - 1 to 5 leaf stage, prior to emergence of 3rd tiller.

Barnyard grass - 1 to 5 leaf.

Volunteer canaryseed - 1 to 6 leaf.

Persian darnel - 1 to 5 leaf stage and before tillering.

Volunteer oats - 3 to 6 leaf.

Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are controlled before tillering.

Cost:

$15.43 to $19.29/acre (1999 suggested retail price).

Rates:

Wild oats, green and yellow foxtail, volunteer oats, barnyard grass, volunteer canaryseed: apply 0.095 L/acre (50 acres/case). Add Score adjuvant at a rate of 0.8 L per 100 L spray solution.

The above weeds plus persian darnel: apply 0.115 L/acre (40 acres/case). Add Score adjuvant at a rate of 1 L per 100 L spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 to 310 kPa (40 to 45 psi).

Nozzles:

80° or 110° flat fan stainless steel nozzles tilted forward at an angle of 45°.

How it Works:

Horizon is a systemic herbicide which is absorbed by leaves and is rapidly translocated to growing points of leaves and stems. Yellowing of leaves and growing points is usually visible in 1-3 weeks, with browning and death visible 3 to 5 weeks after application.

Effects of Growing Conditions:

For optimum results, apply Horizon to actively growing weeds. Do not apply to crops or weeds that are stressed by hot or cool conditions, frost, drought, low fertility, water-saturated soil, disease or insect damage as crop injury and poor weed control may result.

Tank Mixes:

2,4-D amine, MCPA amine, MCPA ester - 500 g/L formulations (0.34 to 0.45 L/acre)
Ally (3 g or 0.003 kg/acre)
Attain (Attain "A" 0.24 L/acre and Attain "B" at 0.40 L/acre)
Buctril M (0.40 L/acre)
Curtail M (0.80 L/acre)
dichlorprop + 2,4-D (0.71 L/acre)
DyVel (0.50 L/acre)
Lontrel (0.11 to 0.17 L/acre) + MCPA 500 ester (0.45 L/acre)
Pardner - (0.40 L/acre)
Refine Extra (8 g or 0.008 kg/acre)
Target (0.40 to 0.61 L/acre)
Thumper (0.40 L/acre)
Unity (one carton per 40 acres)

Refer to the broadleaf herbicide label for crop staging, weed staging, and other product information. When tank mixing, always add the broadleaf herbicide first, followed by Horizon, with the Score adjuvant added last. Reductions in green foxtail and wild oat control may be observed when tank mixed with 2,4-D amine and MCPA amine. Do not tank mix with any additives, pesticides, or fertilizers that are not recommended on the product label.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall within 30 minutes may reduce control.

Grazing: Do not graze or harvest treated crops for forage within 3 days of application.

Preharvest: Do not apply within 60 days of harvest.

Recropping: No restrictions.

Storage: May be frozen.

Aerial Application: Do not apply by air.

Environment: Do not apply within 15 m of rivers, lakes, ponds, wetlands, sloughs, irrigation water, vegetated ditch banks, and water used by livestock or for domestic purposes.

Tank Cleaning:

Thoroughly clean application equipment immediately after spraying. Ensure that all traces of the product are removed. Drain and flush tank walls, boom and all hoses for 10 minutes with clean water. Remove nozzles and screens and wash separately.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison
Warning Eye and Skin Irritant

Kerb 50-W

Herbicide Group – 15
(Refer to page 16)

Company:

Rohm and Haas Canada Inc.

Formulation:

50 percent propyzamide formulated as a wettable powder. Container size - 2.0 kg.

Crops:

Alfalfa (established), bird's-foot trefoil (established), pastures (established).

Weeds:

Quackgrass
Foxtail barley
Wild oats
Chickweed
Orchardgrass
Timothy
Annual grasses

Caution:

Do not use on soils with more than 6 percent organic matter. Do not apply to soils prone to flooding.

Crop Stage:

Apply between October 1 and freeze-up.

Weed Stage:

Pre-emergence.

Cost:

$28.80 to $105.60/acre (1999 suggested retail price).

Rates:

Established grass or grass/legume pastures for control of foxtail barley:
Brown, dark brown or gray wooded soils - 0.36 kg/acre.
Black soils - 0.45 kg/acre.
Application of Kerb to some grasses (e.g. fescues) may cause yield reductions. Do not apply to timothy, crested wheatgrass or meadow fescue.

Alfalfa and bird's foot trefoil:
Annual grasses, volunteer cereals, wild oat control - 0.71 kg/acre.
Quackgrass, orchardgrass, timothy, chickweed control - 0.91 to 1.32 kg/acre.
Dodder control - 1.3 kg/acre. Note that complete control may not be achieved.

Water Volume:

30 to 50 gallons/acre (135 to 225 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

How it Works:

Kerb enters weeds through root uptake. Weeds are killed by root inhibition and abnormal shoot development. Many weeds die before emergence.

Effects of Growing Conditions:

Dry soil conditions at time of weed emergence may result in reduced control. Approximately 3 inches of total precipitation is required for adequate activation. Best results when soil temperatures are low but above freezing.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Surface applications are most effective if followed by 0.5 to 1 inch (1.25 to 2.5 cm) of rain within 2 days of application.

Grazing: Do not graze or harvest for livestock feed within 60 days of application.

Recropping: Do not replant to crops within 1 year of treatment.

Aerial Application: No labelled restrictions. No information on effectiveness or crop injury concerns when applied by air.

Storage: Store in a cool, dry place.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Laddok

Herbicide Groups – 5,6
(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

200 g/L bentazon and 200 g/L atrazine formulated as a solution.
Container size - 10 L.

Crops:

Corn (grain, silage and seed).

Seed corn producers should consult the seed corn company regarding the tolerance of seed production lines to Laddok and oil concentrates.

Weeds:

Refer to Rates for a list of weeds controlled.

Crop Stage:

1 to 5 leaf stage.

Weed Stage:

Apply when weeds are at the height recommended in the rates table.

Cost:

$13.92 to $18.63/acre (1999 suggested retail price).

Rates:

Add Assist at 1.0 L per 100 L of spray solution.

WEEDS	1.21 L/ACRE		1.62 L/ACRE	
	inches	(cm)	inches	(cm)
ANNUAL WEEDS				
Black nightshade			0.2 - 0.8	(0.5 - 2.0)
Buttercup			2 - 4	(5 - 10)
Cocklebur	3 - 7	(7.5 - 17.5)	7 - 12	(17.5 - 30.0)
Common chickweed			Apply 1 to 3 weeks after emergence	
Common groundsel			2 - 4	(5.0 - 10.0)
Common ragweed	1 - 1.5	(2.5 - 4.0)	1.5 - 3	(4.0 - 7.5)
Corn spurry			1 - 4	(2.5 - 10.0)
Giant ragweed			2 - 6	(5 - 15)
Hairy galinsoga			2 - 3	(5.0 - 7.5)
Lady's-thumb (smartweed)	1 - 3	(2.5 - 7.5)	3 - 8	(7.5 - 20.0)
Lamb's-quarters	1 - 2	(2.5 - 5.0)	2 - 4	(5.0 - 10.0)
Purslane			1 - 2	(2.5 - 5.0)
Redroot pigweed	0.7 - 1.2	(1.5 - 3.0)	1.2 - 1.5	(3.0 - 4.0)
Russian thistle			1 - 3	(2.5 - 7.5)
Venice mallow	1 - 2	(2.5 - 5.0)	2 - 4	(5.0 - 10.0)
Wild mustard	1 - 5	(2.5 - 12.5)	5 - 10	(12.5 - 25.0)
PERENNIAL WEEDS	Rate: 1.21 - 1.62 L/acre			
Yellow nutsedge	4 - 6	(10.0 - 15.0)	(repeat 7 - 10 days if necessary)	

Water Volume:

20 to 40 gallons/acre (90 to 180 L/acre).

The higher recommended water volumes and pressures should be used for dense weed infestations or for weeds approaching the upper limit of their recommended stage for treatment.

Pressure:

275 to 300 kPa (40 to 45 psi).

Nozzles:

Flat fan nozzles capable of delivering high water volumes.

How it Works:

The bentazon component of Laddok is a contact herbicide which interferes with photosynthesis and is absorbed primarily through leaves. Weeds turn chlorotic (yellow) and then brown, usually within 2 weeks. The atrazine component of Laddok also inhibits photosynthesis and is absorbed through foliage and roots. It is translocated to areas of high transpiration, such as the edges of mature leaves, which become chlorotic (yellow) and then brown.

Effects of Growing Conditions:

Crop injury may occur if applications are made when crop is under stress because of prolonged cold weather, poor fertility or other factors; or when corn is wet and succulent from recent rainfall.

Best weed control is under warm, humid conditions.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Within 6 - 8 hours of application will reduce control.

Grazing: Do not graze the treated crop or cut for hay prior to crop maturity.

Recropping: No restrictions the year following treatment when label rates for annual weeds have been used. Use of the double application for yellow nutsedge control may cause injury to rotational crops because of carryover of the Atrazine component of the product. Under particularly dry soil conditions, there may be greater carryover of the atrazine component of Laddok which could damage a number of different special crops. Refer to the "Atrazine" product description for information.

Aerial Application: No restrictions on label. No information on effectiveness or crop injury concerns when applied by air.

Storage: Do not freeze.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Laser DF

Herbicide Groups – 1, 4, 2

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

The Laser DF package contains 2 containers labelled "Greenfox" and 2 containers labelled "DF".

Greenfox contains 28 g/L fenoxaprop-p-ethyl and 336 g/L MCPA ester formulated as an emulsifiable concentrate. Container size - 10.1 L.

DF contains 75 percent thifensulfuron methyl formulated as a dry flowable. Container size - 162 grams.

Crops:

Laser DF alone may be used on spring wheat. Laser DF + 2,4-D ester may be used on Manitoba recommended varieties of durum wheat (Medora, Plenty, Scepter and Kyle). Do not use Laser DF on durum unless it is tank mixed with 2,4-D ester. If 2,4-D is not added, severe crop injury may result.

Weeds:

Refer to Weed Stage for a list of weeds controlled.

Crop Stage:

Spring wheat (not durum) - 2 to 6 leaf with a maximum of 3 tillers.

Durum wheat - 2 to 5 leaf with a maximum of 2 tillers.

Application to spring or durum wheat beyond these stages may result in crop damage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

1 to 6 leaf stage of green foxtail (total leaves including tillers) and chickweed. Apply at the 2 to 3 leaf stage of green foxtail for optimum control. Optimum control and yield response occurs when weeds are controlled before tillering.

2 to 4 leaf stage of annual sunflower, mustards (except dog and green tansy), burdock, cocklebur, field horsetail,

flixweed, kochia, prickly lettuce, ragweeds, Russian pigweed, shepherd's-purse, wild radish, plantain, hoary cress, vetch. Cotyledon stage to 4 inches (10 cm) tall or across: corn spurry, cow cockle, green smartweed, hemp-nettle, lamb's-quarters, redroot pigweed, Russian thistle, stinkweed, volunteer rapeseed, wild mustard. 1 to 3 leaf stage of wild buckwheat. Up to 4 inches (10 cm): Canada thistle (suppression only).

Cost:

$11.18/acre (1999 suggested retail price).

Rate:

Apply Greenfox at 0.51 L/acre and DF at 0.008 kg/acre. One jug of Greenfox (10.1 L) and one container of DF (0.162 kg) treats 20 acres.

When applying Laser DF to durum wheat, apply with 0.07 L/acre of 2,4-D LV600 (1.4 L treats 20 acres), or with 0.06 L/acre of 2,4-D LV700 (1.2 L treats 20 acres).

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

Spring wheat: 5 - 10 gallons/acre (23-45 L/acre).

Durum wheat: 10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan nozzles tilted forward at a 45° angle. Screens and filters 50 mesh or coarser.

How it Works:

Fenoxaprop-p-ethyl is a systemic herbicide that is translocated from treated leaves to growing points of green foxtail. Symptoms on green foxtail include reduced leaf growth and chlorosis (yellowing) of treated leaves within 1 to 3 days. Chlorosis progresses and plant death occurs 14 to 21 days after application. 2,4-D is absorbed through the leaves and roots and is translocated throughout the plant. Susceptible weeds exhibit bending and twisting and die in 2 to 3 weeks. DF is slow to act and symptoms, which include discolouration (reddening, purpling or yellowing), may not be noticeable for 1 to 3 weeks after application.

Effects of Growing Conditions:

Do not apply to crop that is stressed by heat, frost, low fertility, drought, water-saturated soil, disease or insect damage as crop injury and/or poor weed control may result. Poor weed control will result if weeds are too large, if coverage is poor or if weeds are not actively growing.

Tank Mixes:

Herbicides: 2,4-D LV ester (durum wheat).

Spring wheat (not including durum) Laser DF may be tank mixed with Lontrel at 0.085 L/acre for season long control of Canada thistle up to 6 inches (15 cm) in height.

Fertilizers: None registered.

Insecticides: None registered.

An interval of 7 days prior to application, or 4 days after application of Laser DF, is required before any other pesticide can be applied.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours of application will reduce control.

Grazing: Do not graze or cut treated crops for forage prior to crop maturity.

Preharvest: Do not apply within 70 days of harvest.

Recropping: No restrictions the year after application.

Aerial Application: Do not apply by air.

Storage: Do not freeze. If stored for 1 year or longer, shake well before using.

Environment: Do not apply within 15 m of a body of water or wetland area.

Tank Cleaning:

The "DF" (thifensulfuron) component of Laser DF can cause severe injury to sensitive crops at very low concentrations. Sprayers used to apply Laser DF should be flushed out immediately after Laser DF is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia rinse (1 L of 3 percent ammonia per 100 L water) prior to using the sprayer on sensitive crops. All nozzles, screens and filters should be removed and cleaned after applying this product. Refer to product label for detailed cleaning instructions.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Poison

Liberty

Herbicide Group – 10
(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

150 g/L glufosinate ammonium formulated as an emulsifiable concentrate.

Container sizes - 13.5 L, 108 L.

Crops:

Liberty may be used **only** on canola varieties that are tolerant to the Liberty herbicide. Canola varieties tolerant to Liberty will be labelled with the Liberty Link symbol. Liberty applications made to **any** other canola varieties or crops will result in crop death.

Crop Stage:

Cotyledon to bolting stage.

Temporary crop discolouration (bronzing) may be observed after application.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Staging:

The stages listed refer to the 1.35 L/acre rate of Liberty. Note that weed staging may differ at lower rates. Refer to the product label for details.

WEED	STAGE
Wild oats, volunteer wheat, volunteer barley	1 to 4 leaf stage with a maximum of 2 tillers
Green foxtail	1 to 6 leaf stage with a maximum of 3 tillers
Cleavers	1 to 2 whorls
Wild buckwheat, stork's-bill	1 to 3 leaf stage
Chickweed, redroot pigweed, quackgrass, cow cockle, barnyard grass, round leaved mallow, volunteer canola	1 to 4 leaf stage
Wild mustard	1 to 5 leaf stage
Smartweed, lamb's quarters, shepherd's purse	1 to 6 leaf stage
Stinkweed, perennial sow-thistle	1 to 8 leaf stage
Hemp-nettle	2 to 8 leaf stage (1 to 4 leaf pairs)
Volunteer flax	Up to 2.5 inches (6 cm) in height
Russian thistle, kochia	Up to 3 inches (8 cm) in height)
Canada thistle, flixweed, scentless chamomile	Up to 4 inches (10 cm) in height
Dandelion	Rosettes up to 6 inches (15 cm) in diameter

Rates and Weeds Controlled:

WEED	RATE (L/ACRE)	ACRES TREATED PER 13.5 L CONTAINER
Wild mustard, smartweed, green foxtail, lamb's quarters, stinkweed, Russian thistle, volunteer flax, cow cockle, barnyard grass, volunteer canola	0.81	16.6
Perennial sow-thistle, chickweed, redroot pigweed, cleavers, shepherd's purse, kochia, scentless chamomile, round leaved mallow Light[1] infestations of volunteer wheat, volunteer barley (suppression only), wild buckwheat Hemp-nettle (1 to 3 leaf pairs) Quackgrass (top growth suppression) Canada thistle (top growth suppression)	1.1	12.4
Volunteer wheat, volunteer barley (suppression only), wild oat, cleavers, wild buckwheat, dandelion, stork's-bill, flixweed Hemp-nettle (1 to 4 leaf pairs) Quackgrass (season long control, light[1] infestations) Canada thistle (top growth suppression)	1.35	10
Quackgrass (season long control) Canada thistle (enhanced top growth suppression)	1.6	8.3

[1] The company does not provide guidelines for weed densities under light infestations. When in doubt as to the infestation level, use the high rate or contact your local AgrEvo representative.

A second application can be made to fields that were treated initially with up to 1.35 L/acre. Do not apply more than 1.35 L/acre in the second application.

Cost:

$13.77/acre (0.81 L/acre)
$18.70/acre (1.1 L/acre)
$22.10/acre (1.3 L/acre)
$27.20/acre (1.6 L/acre)
(1999 suggested retail prices).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° stainless steel flat fan nozzles tilted forward at an angle of 45°.

How it Works:

Liberty is a contact herbicide that is absorbed through foliage. Yellowing and wilting occur 2 to 5 days after application, leading to general browning and plant death 1 to 2 weeks after treatment.

Effects of Growing Conditions:

Liberty activity is influenced by environmental conditions. Cool temperatures (less than 10°C), drought, and low humidity conditions slow weed growth. Applications made under these stressed conditions may result in reduced weed control.

Tank Mixes:

Herbicides: Liberty may be tank mixed at 1.1 L/acre with Venture DG at 0.04 to 0.08 kg (40 to 80 g)/acre for control of volunteer barley. Add Turbocharge at a rate of 0.5 L per 100 L of spray solution.

Liberty may be tank mixed at 1.1 - 1.35 L/acre with Select at 0.0255 L (25.5 mL)/acre for enhanced control of wild oat and volunteer barley. Consult Liberty label for exact weed control options. Add Amigo at 0.5 L per 100 L spray solution.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 4 hours may reduce control.

Grazing: Do not graze the treated crop or cut for feed prior to crop maturity.

Recropping: No restrictions.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Environment: Do not apply within 15 m of environmentally sensitive areas.

Tank Cleaning:

Before and after using Liberty, complete a thorough cleaning of the spray tank, lines and filter. The manufacturer recommends that all traces of Liberty be removed from spraying equipment by flushing with a water/household ammonia mixture (1 L of 3% of ammonia per 100 L water).

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Skin and Eye Irritant

Linuron

Herbicide Group – 7

(Refer to page 16)

Company/Products:

AgrEvo Canada Inc. (Afolan F)
DuPont Canada Inc. (Lorox Toss-N-Go)
United Agri Products (Linuron 480)

The following recommendations are a blend of recommendations of all Linuron products. Consult the individual product labels for specific recommendations.

Formulations:

Afolan F/Linuron 480 - 480 g/L linuron formulated as a flowable. Container size - 10 L.

Lorox Toss-N-Go - 50 percent linuron formulated as a dry flowable. Container size - 5 water soluble bags (500 g each, total 2.5 kg).

Crops:

Post-emergent: - Spring wheat (including durum), oats and barley - only when tank mixed with MCPA amine.
- Caraway, coriander (Afolan F only).

Pre-emergent surface: Soybean, potatoes, sweet white lupins.

Pre-emergent and post-emergent directed spray: field corn.

Shelterbelts (caragana, green ash, Siberian and American elm, Manitoba maple, poplar, willow, white spruce, Colorado spruce, Scots pine).

Weeds:

When tank mixed with MCPA amine in cereals, the following weeds are controlled:

Ball mustard
Chickweed
Cocklebur
Common burdock
Common ragweed
Cow cockle
Field horsetail
  (suppression only)
Giant ragweed
Goat's-beard
Green foxtail
  (suppression only)
Green smartweed
Hare's ear mustard
Hemp-nettle
Indian mustard
Kochia
Lady's-thumb
Lamb's-quarters
Prickly lettuce
Prostrate pigweed
Redroot pigweed
Russian pigweed
Shepherd's-purse
Stinkweed
Stork's-bill
Tartary buckwheat
Tumble mustard
Wild buckwheat
Wild mustard
Wild radish
Wormseed mustard

Pre-emergent surface treatments: Annual sow-thistle, barnyard grass*, common chickweed, common ragweed, crabgrass, goosefoot, green and yellow foxtail, knotweed, lamb's quarters, purslane, redroot pigweed, shepherd's-purse, smartweed, stinkweed, wheat, wild buckwitchgrass, wormseed mustard.
*partial control

Afolan F is registered for wild mustard control only when applied alone in caraway and coriander.

Crop Stage:

Wheat, barley and oats - 2 to 4 leaf stage.

Field corn - apply when corn is at least 15 inches (38 cm) high (highest leaf on free standing plant).

Established shelterbelts (one year old). Apply as an overall spray to dormant stock or as a directed spray if buds have broken.

Caraway, coriander - 2 to 4 leaf stage.

Soybeans, sweet white lupin, potatoes - Pre-emergent surface treatments (after planting but prior to crop emergence). Sufficient moisture (1 to 2 inches or 3 to 5 cm) in the form of rainfall or irrigation is necessary within 7 to 10 days of application or poor weed control will result. Seed the crop at least 2 inches (5 cm) deep.

Make only one application per year to field crops.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Apply when annual broadleaf weeds are in the 2 to 4 leaf stage and when green foxtail is in the 1 to 3 leaf stage.

In shelterbelts, apply when weeds are less than 4 inches (10 cm) tall.

Costs:

Cereals - $4.64 to 6.00/acre plus cost of MCPA

Caraway, coriander - $13.92 to $18.29/acre (1999 suggested retail price).

Shelterbelts - $49.13/acre

Pre-emergent surface - $27.30 to $54.60/acre (1999 suggested retail prices).

Rates:

Post-emergent applications only:

CROP	AFOLAN F (L/acre)	LINURON 480 (L/acre)	LOROX (kg/acre)
Cereals (with 0.45 L/acre MCPA amine 500 g/L)	0.19 - 0.24	0.17 - 0.22	0.17 - 0.22
Field corn (post-emergent* directed spray)	1.01 - 1.90	0.97 - 1.82	0.93 - 1.74
Shelterbelts	1.9 - 3.8	1.8	1.7

*Use lower rate when weeds do not exceed 2 inches (5 cm) and higher rate for weeds up to 8 inches (20 cm) in height, preferably before they are 5 inches (13 cm) high.

For caraway and coriander, apply 0.51 to 0.67 L/acre of Afolan F **(do not apply with MCPA)** for control of wild mustard only.

Pre-emergent surface applications for use on loam to clay soils only:

PRODUCT	AFOLAN F (L/acre)		LINURON 480 (L/acre)		LOROX (kg/acre)	
Organic matter	less than 3%	from 3 - 5%	less than 2%	from 2 - 5%	less than 2%	from 2 - 5%
Field corn	1.01 - 1.52	1.52 - 1.90	0.91[1]	1.31[1]	0.30[2]	0.61[2]
Soybeans	1.01 - 1.52	1.52 - 1.9	0.91 - 1.31	1.31 - 1.82	0.91 - 1.31	1.31 - 1.82
Sweet white lupins	N/A	N/A	0.85	1.25	0.81	1.21
Potatoes	1.01 - 1.52	1.52 - 1.9	0.91	1.82	0.89	1.74

[1] Must be tank mixed with Atrazine 80W. Refer to label for tank mixes with Dual II and/or Primextra.

[2] Must be tank mixed with Dual II + Atrazine or Primextra.

If used on sandy soils, severe crop injury may result.

Water Volume:

Post-emergent: (Cereals) - 10 gallons/acre (45 L/acre).

Pre-emergent surface: 20 to 30 gallons/acre (90 to 135 L/acre)

Shelterbelts - 20 to 40 gallons/acre (90 to 180 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Stainless steel, flat fan nozzles with 50-mesh (or coarser) line strainers and screens.

How it Works:

Linuron is a systemic herbicide which is absorbed through both the foliage and the root system of the plant. Once in the plant, it strongly inhibits photosynthesis. Affected plants appear chlorotic (yellowed) and stunted, and death occurs 10 to 14 days after treatment.

Effects of Growing Conditions:

In post-emergent applications the best weed control occurs when temperatures are moderate, when relative humidity is high and when soil moisture is adequate. Injury to cereals (crop lightening) will occur when the crop is under stress because of drought or disease. This injury is worse when the product is applied at advanced leaf stages.

In pre-emergent surface treatments, rainfall or irrigation (1 to 2 inches or 3 to 5 cm) is required to move linuron into the root zone of germinating seeds. Insufficient moisture will result in poor weed control. Drought conditions after application will result in little to no weed control. If rainfall does not occur within 7 to 10 days of application and prior to crop emergence, a shallow rotary hoeing (0.75 to 1.5 inches/2 to 4 cm) should be made to mix the top layer of soil to help activation. Avoid covering treated ground with untreated soil. If unusually heavy rain follows application, severe crop injury may result from herbicide in the root zone of the crop. Do not use on sandy soils or severe crop injury will result.

Tank Mixes:

Herbicides: For post-emergent applications in cereals, linuron must be tank mixed with MCPA amine. Do not tank mix with other herbicides.

Do not tank mix Afolan F when applied to coriander and caraway.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Recropping: If the intended crop fails, fields treated with Pre-emergent surface applications of linuron, may be seeded back to corn, soybeans, sweet white lupins, or potatoes. Till the soil throughly before reseeding. No restrictions 1 year after treatment.

Aerial Application: No labelled restrictions. No information available on effectiveness or crop injury concerns when applied by air.

Storage: Do not store Afolan F at temperatures below 5°C. Lorox DF may be frozen.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make a recommendation.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Lontrel

Herbicide Group – 4
(Refer to page 16)

Company:

Dow AgroSciences

Formulation:

360 g/L clopyralid formulated as a solution.
Container size - 4.45 L.

Crops:

Canola, spring wheat (including durum), oats, barley, flax (excluding low linolenic acid varieties), and summerfallow.

Seedling and established grasses for forage and seed production (including Kentucky bluegrass, smooth bromegrass, reed canary grass, creeping red fescue, meadow fescue, tall fescue, meadow foxtail, orchard grass, altai wild ryegrass, Russian wild ryegrass, timothy, crested wheatgrass, intermediate wheatgrass, slender wheatgrass and streambank wheatgrass), tall wheatgrass for forage only.

Weeds:

Canada thistle
Scentless chamomile
Perennial sow-thistle (top growth only)
Volunteer alfalfa
Wild buckwheat
Common groundsel
Alsike clover

Crop Stage:

Barley, wheat (spring and durum), oats - 3 to flag leaf stage.

Seedling forage grasses - 2 to 4 leaf stage.

Established grasses - at the shot blade stage, or in the fall after harvest or in early spring.

Flax - 2 to 4 inches (5 to 10 cm) in height.

Canola - 2 to 6 leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Annual weeds - 2 to 4 leaf stage; Canada thistle - after all thistles have emerged and when the majority are in the rosette to pre-bud stage; volunteer alfalfa - 2 to 20 inches (5 to 50 cm) in height.

Cost:

$23.30 to $46.61/acre (1999 suggested retail price).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

Rates:

CROP	RATE (L/ACRE)	ACRES TREATED PER 4.45 L CONTAINER
Rapeseed (canola)	0.17 - 0.34	26.2 - 13.1
Flax	0.23 - 0.34	19.3 - 13.1
Barley, oats, wheat	0.17 - 0.23	26.2 - 19.3
Summerfallow	0.34	13.1
Seedling and established grasses (see list under "Crops")	0.17 - 0.34	26.2 - 13.1

0.17 L/acre - Provides top growth control of Canada thistle for 6 to 8 weeks.

0.23 L/acre - Provides season long control of Canada thistle. Not all root stalks will be killed and some regrowth may occur by the end of the growing season.

0.34 L/acre - Provides season long control of Canada thistle with suppression into the following year.

How it Works:

Lontrel is a growth regulator type herbicide which is absorbed through leaves and stems and is translocated to all parts of the plant. Symptoms include swollen growing points and roots, twisted stems and leaves, and a gradual discoloration from green to yellow to brown. Susceptible plants die in 2-3 weeks.

Effects of Growing Conditions:

Poor control may occur under dry conditions. Injury to flax may occur when tank mixing with MCPA. To reduce the risk of crop injury do not apply tank mixes if temperature exceeds 27°C.

Tank Mixes:

Herbicides: If using products containing bromoxynil (such as Buctril M, Pardner, HoeGrass II) in the same field, Lontrel applications must be delayed for at least 14 days after treatment with these products to allow Canada thistle to recover from leaf burn.

Canola - Lontrel can be mixed with Poast Ultra, Fusion, Hoegrass 284, Odyssey (SMART varieties only), Select or Venture. Use 0.17 L/acre of Lontrel in tank mixes with Hoegrass 284; 0.23 L/acre when tank mixing with Fusion and 0.17 to 0.23 L/acre when tank mixing with Odyssey.

Roundup Ready Canola only - When applying Roundup Original or Roundup Transorb (0.5 L/acre), Lontrel at 0.112 L/acre can be added for improved control of Canada thistle and wild buckwheat.

Flax - Lontrel at 0.17 L/acre may be tank mixed with MCPA amine or ester. Use 0.34 to 0.45 L/acre MCPA (500 g/L formulations). Lontrel may be mixed with Poast Ultra or with Poast Ultra and MCPA ester. Refer to the Poast Ultra label for rates.

Wheat, barley - Lontrel at 0.11 to 0.17 L/acre may be tank mixed with 2,4-D amine or ester or MCPA amine or ester. Lontrel may be tank mixed at 0.20 L/acre with Achieve + MCPA ester.

Spring wheat (excluding durum) and barley - Lontrel at 0.085 L/acre may be mixed with Refine Extra (8 g/acre) plus either MCPA ester (0.34 L/acre of 500 g/L formulation) or 2,4-D ester (0.28 L/acre of 600 g/L formulation). Lontrel at 0.085 L/acre may also be tank mixed with Triumph Plus (20 acres per case rate). Add a recommended surfactant at 0.2% of the final spray volume.

Oats - Lontrel at 0.11 to 0.17 L/acre may be tank mixed with MCPA amine or ester.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Crops or areas treated with this product may be grazed immediately following treatment.

Recropping: Lontrel residues in the soil may affect succeeding crops. The year after application, replant to wheat, barley, oats, rye, flax, forage grasses, mustard or canola. Do not sow potatoes into fields treated with Lontrel until the third growing season after the year of treatment. Do not use manure from animals fed or bedded with Lontrel-treated straw except on fields that are to be sown to Lontrel-tolerant crops.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled broadleaf crops may be severely injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

MCPA

Herbicide Group – 4
(Refer to page 16)

Company:

Various. Application details may differ with different product labels. Consult specific product labels for more information.

Formulations:

500 g/L amine, 300 g/L sodium salt and 400 g/L potassium salt formulated as solutions; 564 and 500 g/L ester formulated as emulsifiable concentrates.

Container size - various.

Weeds:

Susceptible weeds controlled by MCPA amine and ester in cereals include:

Burdock
Cocklebur
Flixweed[2]
Kochia
Lamb's-quarters
Mustards (except dog)
Prickly lettuce
Ragweed
Russian pigweed
Shepherd's purse[2]
Stinkweed[2]

Harder to control weeds for MCPA amine and ester in cereals include:

Annual sow thistle[1]
Bluebur
Blue lettuce[1]
Canada thistle[1]
Common peppergrass
Curled dock
Dog mustard
Goosefoot
Hemp-nettle (suppression only)
Leafy spurge[1]
Perennial sow thistle[1]
Redroot pigweed
Russian thistle[1]

[1]Top growth control only.
[2]Spring seedlings.

Weed Stage:

2 to 4 leaf stage. Winter annual control in late fall - rosette stage.

Crop Stage:

CROP	STAGE
Wheat (spring and durum), barley, oats	3 leaf to early flag leaf.
Spring rye	2 leaf to early flag leaf.
Fall rye	Spring application only. Apply after growth commences in the spring, but before the early flag leaf stage.
Winter wheat	In spring, apply from the time winter wheat growth commences until the early flag leaf stage. May be treated in the fall for winter annual weed control (**caution:** this is not a registered treatment, any such use is at the risk of the user).
Flax	2 inches (5 cm) in height to prebud stage. Apply at 2 to 4 inches (5 to 10 cm) in height for maximum crop tolerance.
Peas	Vines 4 to 7 inches (10 to 18 cm) long. For short-statured, determinate flowering peas, apply at the early stages within this range.
Underseeded alfalfa (except Flemish varieties), alsike clover, red clover	Apply when the majority of seedling legumes are in the 1 to 3 trifoliate leaf stage.
Grass pastures	Spring or fall.
Seedling forage grasses[1] (not for seed)	Apply from the 3 leaf stage to the shot blade stage.
Established forage grasses[1] (not for seed)	Apply in the spring up to the shot blade stage or in the fall after harvest.

[1]MCPA is not registered for use on forage grasses, any such use is entirely at the risk of the user.

Crops and Rates:

CROP	MCPA AMINE (500 g/L) L/ACRE	MCPA ESTER (500 g/L) L/ACRE	MCPA K (400 g/L) L/ACRE	MCPA SODIUM SALT (300 g/L) L/ACRE
Spring wheat, barley, oats	0.28 to 0.71[1]	0.28 to 0.71[1]	0.65 to 0.81	0.51 to 1.11[4]
Spring rye	0.28 to 0.71[1]	0.28 to 0.71[1]	Not registered	0.51 to 1.11[4]
Flax	0.28 to 0.45[2]	0.28 to 0.45[2]	0.65 to 0.81	0.51 to 1.11[4]
Winter wheat, fall rye	0.22 to 0.45	0.22 to 0.45	Not registered	0.51 to 1.11[4]
Corn	0.30 to 0.51	Not registered	Not registered	0.40 to 0.61
Peas	0.13 to 0.22	Not registered	Not registered	0.36[3]
Cereals underseeded to alfalfa (not Flemish varieties), red and alsike clover - for emergency use only	Not registered	Not registered	Not registered	0.40
Grass pastures	0.81 to 1.42	0.81 to 1.42	Not registered	Not registered
Seedling forage grasses (not for seed)	Up to 0.45[5]	Not registered	Not registered	Not registered
Established forage grasses (not for seed)	Up to 0.90[5]	Not registered	Not registered	Not registered

Use the higher rates for harder to kill weeds, for dry or cool weather conditions, or when weed infestations are heavy.
[1] Rates above 0.45 L/acre may cause crop injury. [2] Rates above 0.34 L/acre may cause crop injury. [3] This rate is lower than the registered rates for peas. Less than the maximum label rates are recommended because of crop injury concerns. [4] Rates above 0.81 L/acre may cause crop injury. [5] MCPA is **NOT** registered for use on forage grasses, any such use is entirely at the risk of the user.

Formulation Characteristics:

Formulation	Risk of Vapour Drift	Activity on Weeds	Risk of Crop Injury
LV Ester	Medium	Fast	Medium
Amine	Very Low	Medium	Low
Salts	Very Low	Slow	Very Low

Cost:

MCPA amine - $6.25/L (500 g/L formulation)

MCPA ester - $7.15/L (500 g/L formulation)

MCPA sodium salt - $4.72/L (300 g/L formulation)

MCPA K - $5.40/L (400 g/L formulation)

(1999 suggested retail prices).
Prices may vary depending on supplier.

Water Volumes:

Cereals, flax, pastures, forage grasses - 10 to 20 gallons/acre (45 to 90 L/acre).

Peas - 15 gallons/acre (70 L/acre).

Cereals underseeded to alfalfa, red and alsike clover - 15 to 20 gallons/acre (70 to 90 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

MCPA is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Best weed control occurs when temperatures are above 21°C and humidity is above 70 percent. Do not apply if temperature exceeds 27°C. If applying to flax, injury and a delay in maturity may result from application under hot or humid conditions. Extremely hard water may reduce performance or cause problems in spraying the product.

Tank Mixes:

Herbicides: See table. Not all brands are labelled for tank mixing. Check the product label prior to use. Follow all precautions and restrictions on both labels.

Fertilizers: None registered.

Insecticides: May be tank mixed with Decis, Lorsban or Pyrinex.

Fungicides: Certain formulations may be tank mixed with Tilt. Refer to the Tilt label for details.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours of MCPA sodium salt or MCPA K, 4 hours of MCPA amine, or 2 hours of MCPA ester application will reduce control.

Grazing: Do not graze within 7 days of application.

Recropping: No restrictions the year after application.

Aerial Application: Some amine and MCPA K products may be applied by air. Check the label for detailed instructions.

Storage: MCPA ester may be frozen. Do not freeze MCPA amine, MCPA sodium salt and MCPA K.

Herbicide Tank Mixes:

CROP	MCPA AMINE	MCPA ESTER	MCPA K	MCPA Sodium salt
Wheat	Accord, Afolan F, Ally, Banvel II, Buctril M, Horizon, Linuron, Lontrel, Lorox L, Pardner, Puma, Refine Extra, Sencor, Stampede EDF	Accord, Achieve, Ally, Assert, Avenge, Buctril M, Lontrel, Pardner, Harmony Total, Horizon, Refine Extra, Puma, Sundance, Stampede EDF	Banvel II, Buctril M, Pardner	Buctril M
Barley	Afolan F, Ally, Banvel II, Buctril M, Linuron, Lontrel, Lorox L, Pardner, Refine Extra, Sencor	Achieve, Ally, Assert, Avenge, Buctril M, Lontrel, Pardner, Champion Extra, Refine Extra, Stampede EDF	Banvel II, Buctril M, Pardner	Buctril M
Oats	Afolan F, Banvel II Buctril M, Linuron, Lontrel, Lorox L, Pardner, Refine Extra	Buctril M, Lontrel, Pardner, Refine Extra, Stampede EDF	Banvel II, Buctril M, Pardner	Buctril M

CROP	MCPA AMINE	MCPA ESTER	MCPA K	MCPA Sodium salt
Fall rye	Pardner	Pardner	Pardner	None
Winter wheat	Pardner, Refine Extra	Avenge, Refine Extra	Pardner	None
Flax	Fusion, Lontrel	Poast Ultra, Fusion, Select, Lontrel, Stampede EDF	None	None
Peas	Not recommended	Not recommended	Not recommended	Sencor

Tank Cleaning:

Sprayers used to apply MCPA should be flushed out immediately with a water/household ammonia rinse (1 L of 3 percent ammonia per 100 L of water).

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

MCPB + MCPA

Herbicide Group – 4

(Refer to page 16)

Company:

IPCO (Clovitox Plus)
Nufarm (Tropotox Plus)

Formulation:

375 g/L MCPB, 25 g/L MCPA formulated as a solution.

Container size - 10 L.

Crops:

Registered for both Tropotox and Clovitox:
Peas, pastures, seedling alsike clover, red clover or white Dutch clover sown alone or with a barley, wheat, rye or oat companion crop.

Registered for Tropotox only:
The following seedling grasses: bromegrass (smooth, meadow), fescue (altai, creeping red, meadow, tall), needlegrass (green), reed canarygrass, timothy, wheatgrass (crested, intermediate, northern, pubescent, slender, streambank, tall, western), wild ryegrass (altai, Russian)

Weeds:

Weeds controlled:

Ball mustard
Bull thistle
Canada thistle
Curled dock
Lamb's-quarters
Plantains
Ragweed
Volunteer canola
Redroot pigweed
Shepherd's-purse
Stinkweed
Wild mustard
Wormseed mustard

Suppression:

Annual sow-thistle
Hemp-nettle
Wild radish

Top growth suppression:

Creeping buttercup
Field bindweed
Horsetail
Perennial sow-thistle
Tall buttercup

Crop Stage:

Peas - When plants have 3 to 6 expanded leaves.

Clover - Apply between the 1 to 3 trifoliate leaf stage.

Oats, wheat, rye or barley companion crop - Between 2 leaf and flag leaf stage.

Seedling grasses - 2 to 4 leaf stage.

Weed Stage:

2 to 4 leaf stage for annual weeds. See label for specific perennial weed staging.

Cost:

$13.10 to $20.36/acre (1999 suggested retail price).

Rate:

To control wild mustard, ball mustard, wormseed mustard, stinkweed and lamb's quarters, use 1.11 L/acre. For heavy weed infestations, and for control of other labelled weeds, or if cool, dry conditions prevail, apply 1.72 L/acre.

Do not exceed 1.4 L/acre on seedling grasses.

Water Volume:

15 to 20 gallons/acre (70 to 90 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

MCPB + MCPA is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Weather:

Damage to peas or seedling forage legumes may occur if the crop is sprayed when under drought or disease stress. Under extremely hot or humid conditions, crop injury may be severe. Best activity on weeds occurs in warm weather.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crop or cut for hay in the year of establishment. Do not use treated cereals for grazing or cut for greenfeed until 30 days after application.

Recropping: No restrictions listed. Phenoxy herbicides can persist in soils for weeks, particularly if dry or cool weather persists. Do not seed sensitive crops immediately after spraying.

Aerial Application: No labelled restrictions.

Storage: Do not freeze.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled broadleaf crops can be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Poison

Mecoprop

Herbicide Group – 4
(Refer to page 16)

Company:

United Agri-Products (Mecoprop)
Nufarm (Compitox)

Formulation:

150 g/L mecoprop present as potassium salt. Container size - 10 L.

Crops:

Spring wheat (including durum), barley and oats.

Weeds:

- Black medic
- Canada thistle
  - (top growth control only)
- Chickweed
- Cleavers
- Clover (volunteer)
- Corn spurry
- Lamb's-quarters
- Plantain
- Wild mustard

Crop Stage:

3 leaf to flag leaf stage.

Weed Stage:

2 to 4 leaf stage. (Mecoprop)
3 to early flag stage (Compitox)

Cost:

$13.75 to $17.50/acre (1999 suggested retail price).

Rates:

2.2 to 2.8 L/acre. Use the high rate for weeds in an advanced stage of growth.

Water Volume:

20 to 30 gallons/acre (90 to 135 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Mecoprop is a systemic herbicide that is absorbed through foliage and roots and is translocated to actively growing areas within the plant. Symptoms on susceptible weeds include bending and twisting of leaves and stems within 2 to 7 days, followed by browning and plant death 3 to 4 weeks after application.

Effects of Growing Conditions:

Apply in warm weather under good growing conditions. Avoid spraying in very hot weather or in drought conditions.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze or feed treated crop to livestock prior to crop maturity.

Recropping: No restrictions the year after application.

Aerial application: Not registered.

Storage: Do not freeze.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Tank Cleaning:

The manufacturer does not provide information on tank cleaning. Generally, a mixture of water and household ammonia (1 L per 100 L of water) flushed twice through the tank and circulated through the lines and nozzles is an effective method of cleaning the sprayer tank.

Hazard Rating:

Caution Poison

Muster Gold/Muster Gold II

Herbicide Group – 1, 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulations:

Muster Gold / Muster Gold II contains 3 components each:

Muster - 75 percent ethametsulfuron-methyl as a water dispersible granule. Container size - 2 x 80 g water soluble bags (Muster Gold)/ 4 x 80 g water soluble bags (Muster Gold II)

Assure / Assure II - 96 g/L quizalofop ethyl / quizalofop-p-ethyl as an emulsifiable concentrate. Container size - 8 L (both products).

Sure - Mix adjuvant. Container size - 4 L (Muster Gold)/ 8 L (Muster Gold II)

Crop:

Canola, including all herbicide tolerant canola

Weeds:

Green foxtail, volunteer cereals, volunteer corn, wild oat, barnyard grass, quack grass (suppression), flixweed, smartweed (lady's-thumb), hemp-nettle, wild mustard, stinkweed, redroot pigweed (suppression)

Crop Stage:

2 leaf stage to the beginning of bolting. If application is made prior to this stage, severe crop injury may occur.

Weed Stage:

Annual grasses: 2 leaf to early tillering.

Quackgrass: 2 - 6 leaf stage.

Stinkweed: 1 - 4 leaf stage.

For optimum control, apply Muster Gold / Muster Gold II at the cotyledon to 6-leaf stage of the target broadleaf weeds.

For best results on volunteer cereals / wild oats apply before tillering begins.

Cost:

$19.50 / acre (1999 suggested retail price)

Rates:

A box of Muster Gold will treat 20 acres (8 ha). A box of Muster Gold II will treat 40 acres (16 ha).

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallon / acre (45 L / acre)

Pressure:

210 to 275 kPa (30 to 40 psi)

Nozzles:

Flat fan nozzles with 50 mesh line strainers and screens.

How it Works:

Assure / Assure II is a systemic herbicide rapidly absorbed and readily translocated from the treated foliage to the root system and growing points. Symptoms in grasses are reduced growth and chlorosis (yellowing) of new leaves within 1 to 2 weeks of application, eventually resulting in death of the plant. Muster is absorbed by the foliage and roots and inhibits plant growth. Discolouration (yellowing, reddening and purpling) of susceptible plants is noticeable within 1-2 weeks of application. Eventually discolouration progresses to plant death.

Effects of Growing Conditions:

Crop injury and reduction in control may occur if plants are under stress as a result of drought, frost, flooding, disease or insect injury. Less than acceptable control will occur on fields where high weed populations exist and where stressful environmental conditions prevail (drought, cold weather). Heavy rainfall soon after application may result in visual crop injury or possible yield reduction. Thin crop stands or application prior to the 2 leaf stage, sandy soils or soils with low organic matter may increase the severity of the injury.

Restrictions:

Rainfall: Rainfall within 4 hours will reduce control.

Grazing: Do not graze or feed crop to livestock within 60 days of application.

Recropping: Interval prior to planting:

10 months - spring wheat, durum wheat, barley, flax, oats.

22 months - alfalfa, canarygrass, canola, drybeans, fababeans, fescue, lentils, peas, red clover, tame mustard. All other crops, a field bioassay is required at 22 months.

Aerial Application: Do not apply by air.

Storage: Store in a cool dry place

Environment: Do not mix or load within 30 m of wetland areas or bodies of water. Leave a 15 m buffer between the last spray pass and wetland areas or water bodies. Leave a 5 m buffer between the last spray pass and woodlots, shelterbelts, ditch-bank vegetation and the borders of dry sloughs.

Tank Cleaning:

To avoid injury to susceptible crops, thoroughly clean sprayer immediately after spraying. Drain tank and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for a minimum of 5 minutes. Fill the tank with water while adding 1 litre of household ammonia (minimum 3 percent ammonia) for every 100 L of water. Flush hoses, boom and nozzles with the cleaning solution, then add more water to completely fill the tank. Circulate for 15 minutes. Again flush hoses, boom and nozzles with the cleaning solution, and then drain the tank. Remove and clean the nozzles and screens separately in a bucket containing a 1 percent solution of ammonia in water (1 L of 3 percent ammonia in 100 L water). If the spray equipment is to be used to spray crops other than cereals, repeat the above process and thoroughly wash the spray mixture from the outside of the spray tank and the boom. Thoroughly rinse the tank with clean water for a minimum of 5 minutes, flushing the water through the hoses and boom. Prior to using the sprayer again, flush the tank, boom and hoses for 5 minutes with fresh water.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent or walk.

Hazard Rating:

Caution Poison

Warning Skin and Eye Irritant

This product contains 4 percent phenol, which has been determined to be of toxicological concern.

Muster Toss-N-Go

Herbicide Group – 2

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

75 percent ethametsulfuron-methyl formulated as a dry flowable. Container sizes - 4 water soluble bags (80 g each, total 320 g).

Crops:

Canola (rapeseed), condiment mustard (brown and oriental only).

Crop Stage:

Canola - Crop must be in the 2 leaf stage (true leaves) to the beginning of bolting. Do not apply prior to this stage as severe crop injury can occur.

Mustard - Crop must be in the 4 leaf stage but prior to bolting. Do not apply prior to this stage as severe crop injury can occur. Spraying must take place at least 60 days prior to harvest.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 6 leaf stage. Stinkweed must be sprayed in the 1 to 4 leaf stage.

Cost:

$14.95 to $22.48/acre (1999 suggested retail price).

Weeds Controlled and Rates:

8 g/acre - flixweed[1], green smartweed, hemp-nettle, wild mustard, stinkweed[2]. One case treats 40 acres.

12 g/acre weeds listed above plus stinkweed, redroot pigweed[2]. One case treats 26.7 acres.

[1] Spring seedlings only

[2] Suppression with Muster alone but control with Assure II plus Hi-Mix/Sure-Mix or a Poast Ultra + Merge tank mix

Muster applied alone requires the addition of Agral 90, Agsurf, or Citowett at 0.2 L per 100 L of spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Equipment and Nozzles:

Flat fan nozzles. Sprayer must be equipped with continuous agitation. Use 50 mesh or coarser strainers and screens.

How it Works:

Muster is absorbed by foliage and roots, and inhibits plant growth. Symptoms, including discolouration (yellowing, reddening, purpling) of susceptible weeds are noticeable 1 to 2 weeks after application.

Effects of Growing Conditions:

Do not use on crops that are stressed because of drought or flooding. Less than acceptable control will occur in fields where high weed populations exist and where stressful environmental conditions prevail (drought, cold weather). Heavy rainfall soon after application may result in visual crop injury or possible yield reduction. Thin crop stands or application prior to the 2 leaf stage, sandy soils or soils with low organic matter may increase the severity of the injury.

Tank Mixes:

Do not mix with substances that contain boron or that release chlorine.

Herbicides: Canola - Muster may be tank mixed with Assure II, Poast Ultra or Select. No additional adjuvant is required with tank mixes.

Fertilizers: None registered. Do NOT mix soluble bags with liquid fertilizers.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 4 to 6 hours will reduce control.

Grazing: Do not graze or feed crop to livestock within 60 days of application.

Preharvest: 60 days

Recropping: Do not sow wheat, barley, oats or flax within 10 months of application. Do not sow canola, lentils, peas, fababeans, tame mustard, alfalfa, canaryseed, dry beans, fescues or red clover within 22 months of application. All other crops must not be sown until a "field bioassay" is performed at 22 months (or more) after application. Growers may experience reduced yields if other crops (such as corn) are grown without following these guidelines.

Aerial Application: Do not apply by air.

Storage: May be frozen.

Environment: Leave a 15 m buffer between the last sprayer pass and wetland areas or waterways. Leave a 5 m buffer between the last spray pass and woodlots, shelterbelts, ditch bank vegetation and the borders of dry sloughs.

Tank Cleaning:

Sprayers used to spray Muster should be flushed out immediately after Muster is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia rinse (1L of 3 percent ammonia per 100 L water). All nozzles, screens and filters should be removed and cleaned after applying this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Odyssey

Herbicide Group – 2
(Refer to page 16)

Company:

Cyanamid Crop Protection

Formulation:

35 percent imazamox and 35 percent imazethapyr formulated as a dispersible granule. Container size - 4 x 173 g water soluble bags and 1 x 8.1 L jug of Merge.

Crops:

Field peas and Smart canola varieties. Apply **only** to Smart canola varieties; application to **any** other variety of canola will result in crop death.

Weeds Controlled and Rates:

At 0.012 kg/acre (60 acres/case), Odyssey will control:

Redroot pigweed
Wild mustard
Volunteer tame mustard

At 0.017 kg/acre (40 acres/case), Odyssey will control:

Barnyard grass
Chickweed
Cleavers
Flixweed
Green foxtail
Green smartweed
Hemp-nettle[1]
Kochia
Lamb's quarters[2]
Persian darnel
Redroot pigweed
Russian thistle
Shepherd's-purse
Stinkweed
Stork's-bill
Volunteer canola
  (not Smart varieties)
Volunteer cereals
  (wheat, barley, oats)
Volunteer tame mustard
Wild buckwheat[1]
Wild mustard
Wild oats

[1] Suppression only in field peas.

[2] Suppression only in field peas and Smart canola.

Apply with Merge at a rate of 0.5 L per 100 L spray solution. Do not apply more than once per year.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Crop Stage:

Field peas - 1 to 6 above-ground nodes (1 to 6 true leaves). Smart canola - 2 to 6 leaf stage. Temporary crop yellowing may be observed shortly after application in field peas and Smart canola.

Weed Stage:

Grassy weeds - 1 to 4 leaf stage. Broadleaf weeds - cotyledon to 4 leaf stage. Cleavers - cotyledon to 4 whorl stage.

Cost:

$18.12 to $25.67/acre (1999 suggested retail price).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan. Use 50 mesh or coarser filter screens.

How it Works:

Odyssey is a systemic herbicide that is absorbed through foliage and plant roots and is translocated to growing points in plants. Symptoms appear in 3 to 10 days and include yellow striping on the newest leaves of grassy weeds, and yellowish, purplish, or reddish discolouration of the newest leaves of broadleaf weeds. Symptoms progress to older leaves and plant death occurs in 1 to 3 weeks.

Effects of Growing Conditions:

No information provided on the product label. Plants are under stress when conditions before or after application are very hot or cold, or excessively dry or wet. During periods of stress, plants are not actively growing and reduced weed control or crop injury may result.

Tank Mixes:

Herbicides: Odyssey may be tank mixed with Lontrel (0.17 - 0.23 L/acre) in SMART canola only.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze treated crop or cut for feed prior to crop maturity. Field peas may be fed to livestock 30 days after application.

Preharvest: Do not apply within 60 days of harvest.

Recropping: Field peas, Smart canola, and spring wheat (including durum) may be grown the year after application. The company recommends that a field bioassay (a test strip grown to maturity) be conducted the year before growing any crops other than those listed above. Contact your local Cyanamid Crop Protection representative for additional information on recropping intervals.

Aerial Application: Do not apply by air.

Storage: Do not freeze. Store in a cool, dry place above 5°C.

Hazard Rating:

Warning Eye Irritant

Pardner

Herbicide Group – 6

(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

280 g/L bromoxynil.

Container size - two 8 L containers per case.

Crops:

Barley
Canaryseed
Chemical fallow
Corn (field and sweet)
Fall rye
Flax
Oats
Triticale
Wheat (durum, spring and winter)
Zero or minimum tillage

Established alfalfa (seed production only)
Seedling alfalfa

Seedling grasses, for seed production only (brome grass, crested wheatgrass, intermediate wheatgrass, slender wheatgrass, tall wheatgrass, Russian wild ryegrass, timothy, orchard grass, creeping red fescue, meadow fescue, reed canary grass)

Crop Stage:

CROP	STAGE
Barley, oats, triticale, wheat (spring and durum)	2 leaf stage to early flag
Fall rye	In spring only, from first growth to early flag
Winter wheat	2 to 4 leaf stage (fall application) First growth to early flag leaf (spring application)
Corn (field or sweet)	4 to 8 leaf
Corn (field or sweet) with drop pipes	Beyond 8 leaf
Canaryseed	3 to 5 leaf
Established alfalfa	In spring, before the crop begins to shield weeds. Apply no more than twice in one growing season.
Seedling alfalfa	2 to 6 trifoliate leaf stage
Seedling grasses	2 to 4 leaf
Flax	2 to 4 inches (5 to 10 cm)

Weeds Controlled and Staging:

Weeds controlled at the 1 to 4 leaf stage:

American nightshade
Bluebur
Cocklebur
Common ragweed
Cow cockle[1]
Green smartweed
Kochia[2]
Lady's-thumb
Pale smartweed
Pigweed
Stinkweed[1]
Russian thistle[2]
Wild mustard[1]

[1] Use high rate.

[2] Apply before plants are 2 inches high.

Weeds controlled at the 1 to 8 leaf stage:

Common groundsel
Lamb's-quarters
Tame buckwheat
Tartary buckwheat
Wild buckwheat

Cost:

$7.87 to $9.54/acre (1999 suggested retail price).

Rate:

0.405 to 0.485 L/acre (one 8 L container treats 20 to 16.5 acres). Canaryseed, seedling alfalfa - 0.405 L/acre (one 8 L container treats 20 acres). Use the higher rate if weeds are at the more advanced stages of the recommended treatment stages.

Water Volume:

Corn - 20 to 30 gallons/acre (90 to 135 L/acre).

Seedling grasses - 15 gallons/acre (70 L/acre).

Other crops - 10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Pardner is a contact herbicide. Therefore, good coverage is essential. Plants turn brown and die in 3 to 5 days.

Effects of Growing Conditions:

Avoid spraying if temperatures are greater than 25°C. Leaf scorching may occur in corn if applied during or after adverse growing conditions, such as cool and wet or hot (greater than 27°C) and humid weather.

Tank Mixes:

Herbicide Tank Mix Table

CROP	PARDNER TANK MIXES
Spring wheat	2,4-D, Achieve, Avenge, Avenge + MCPA ester, MCPA, Horizon, Hoe-Grass 284, Sundance
Winter wheat	Achieve, MCPA, 2,4-D
Barley	2,4-D, Achieve, Avenge, Hoe-Grass 284, Avenge + MCPA ester, MCPA
Oats	MCPA amine, MCPA ester, MCPA K
Fall rye, canaryseed, seedling forage grasses	MCPA amine, MCPA ester, MCPA K
Corn	Atrazine, Banvel II (field corn only) (do not add oil or surfactant)
Pre-seeding cereals	Glyphosate
Summerfallow	Glyphosate

Fertilizers: None registered.

Insecticides: May be tank mixed with Decis.

Fungicides: May be tank mixed with Tilt.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour of application will reduce control.

Grazing: Do not graze treated wheat, barley, oats or seedling alfalfa crops or cut for feed within 30 days of application. Do not graze other treated crops or cut for hay prior to crop maturity.

Recropping: No restrictions.

Aerial Application: Registered for aerial application on wheat and barley. The use of low water volumes (2 to 4 gallons/acre - 9 to 18 L/acre) may result in less effective weed control than seen with ground application.

Storage: May be stored at freezing temperatures. Will return to original state by warming to room temperature (20 to 22°C) and agitating thoroughly.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled broadleaf crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Pea Pack

Herbicide Group – 4, 5
(Refer to page 16)

Company:

Bayer Inc.

Formulation:

Sencor 75DF (75 percent metribuzin formulated as a dispersible granule). Container size - 3 kg.

MCPA sodium salt (300 g/L MCPA sodium salt) formulated as a solution. Container size - 7.6 L.

Crops:

Peas.

Do not use on lentils or chickpeas.

Do not use on peas seeded less than 2 inches (5 cm) deep or on soils with less than 4 percent organic matter.

Weeds:

Lamb's-quarters, redroot pigweed, stinkweed, volunteer canola (including all herbicide-tolerant canolas except triazine-tolerant cultivars), wild mustard.

Weed stage:

Post-emergence applications should be made when weeds are small i.e. less than 2 inches (5 cm) in height or diameter.

Cost:

$5.95/acre (1999 suggested retail price).

Rate:

77 g Sencor DF and 189 mL MCPA sodium salt per acre. Each case will treat 40 acres.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

15 gallons/acre (70 L/ha)

Pressure:

200-275 kPa (30-40 psi)

Nozzles:

Flat fan nozzles with an opening no smaller than 8002 or TK2 with 50 mesh screen. Angle nozzles 45° forward.

Crop Stage:

Apply before pea vine is 6 inches (15 cm) long.

How it Works:

Sencor is a systemic herbicide that kills weeds by stopping photosynthesis. MCPA sodium salt is a systemic herbicide that disrupts cell division. MCPA sodium salt is absorbed through leaves and roots and is translocated to actively growing areas in the plant. Control of susceptible weeds occurs within 7 to 10 days.

Effects of Growing Conditions:

Crop height reductions or yellowing may occur if high temperatures occur within 48 hours of application. Cold, cloudy weather or frost within 3 days of application may also aggravate crop injury. If frost occurs, allow 4 to 5 days for crop to recover prior to applying Sencor. Applications made under conditions of high humidity may cause pea vines to droop, but the crop will recover quickly.

Tank Mixes:

None registered.

Allow 4 to 5 days between applications of Pea Pack and the application of another pesticide.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Rainfall within 6 hours of application may reduce control.

Grazing: Do not graze treated crops within 30 days of application, or peas within 70 days of application.

Preharvest: Do not harvest peas within 70 days of application.

Recropping: There are no recropping restrictions the year following application.

Storage: Do not freeze.

Tank Cleaning:

Spray equipment must be thoroughly cleaned to remove traces of herbicide that might injure other crops to be sprayed. Drain any remaining solution from the spray tank. Rinse the spray tank and refill with water, adding a heavy-duty detergent at the rate of 0.25 L per 100 L of water. Recycle this mixture through the equipment for 5 minutes and spray out. Repeat this procedure twice. Fill the spray tank with clean water, recycle for 5 minutes, and spray out. Clean pump and nozzle screens thoroughly.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent.

Hazard Rating:

Warning Poison

Pinnacle

Herbicide Group – 2

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

75 percent thifensulfuron methyl as a water dispersible granule. Container size – 8 x 8 g water soluble pouches

Crop:

Soybeans

Weeds Controlled:

Lady's-thumb, lamb's-quarters[1], redroot pigweed, wild mustard, velvetleaf[1].

[1] High rate of application only

Crop Stage:

First fully expanded trifoliate leaf to flower initiation.

Weed Stage:

Up to 10 cm (4 inches) tall or wide.

Cost:

$ N/A

Rates:

2.2 to 3.3 grams per acre (one container treats 20 to 28.5 acres). Requires the addition of a non-ionic surfactant such as Agral 90, Agsurf, or Citowett at 1 L per 1000 L of spray solution.

Mixing order is important for complete product effectiveness. Please refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

Minimum of 10 gallons / acre (45 L / acre)

Pressure:

275 kPa (40 psi)

Nozzles:

Flat Fan

How it Works:

Pinnacle is a systemic herbicide that is absorbed through the foliage and translocated to the growing points within plants. Growth stops soon after application of Pinnacle. After 1 to 3 weeks plants will discolour (yellowing, reddening, or purpling) starting with the newest leaves and spreading out from there eventually resulting in plant death.

Effects of Growing Conditions:

Pinnacle applied to crops that have been under stress before application may result in crop injury. Stress conditions within 3 days after application may also result in crop injury.

Weeds under stress conditions at the time of application may not be adequately controlled.

Stress conditions are severe weather conditions, frost, low fertility, drought, water-saturated soils, and disease or insect damage.

Injury symptoms can be crop discoloration (yellowing, purpling or reddening), or stunting.

Tank Mixes:

Herbicides:

Assure II at 0.2 L / acre with the addition of Sure-Mix at 0.5 percent (5 L per 1000 L of spray solution).

Basagran at 0.71 to 0.91 L / acre plus Assist at 0.405 to 0.81 L / acre.

Fertilizers: None.

Insecticides: None

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: If rainfall occurs soon after application control may be reduced. Several hours of dry weather are needed after application to allow uptake by the plants.

Grazing: Do not graze or cut for feed.

Pre-harvest interval: Must not be harvested within 60 days of application.

Recropping Interval: Do not plant any crop other than wheat or barley for 30 days after application.

Aerial Application: Do not apply by air.

Storage: Store in closed original container in a dry area away from food or feed.

Environment: Do not mix, load or apply within 15 m of water bodies, wetlands or sensitive plants. Do not apply to irrigated land where the drainage water is also used to irrigate cropland.

Tank Cleaning:

Pinnacle can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Pinnacle should be flushed out immediately after use. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia rinse (1 L of 3 percent ammonia per 100 L of water). All nozzles, screens and filters should be removed and cleaned separately during the cleaning process.

Hazard Rating:

Warning – Eye and Skin Irritant

Platinum

Herbicide Group – 1, 6

(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

Each case treats 20 acres and contains a 1.84L jug of Horizon 240 EC (240g/L clodinafop - propargyl formulated as an emulsifiable concentrate), an 8L jug Buctril M (280g/L bromoxynil and 280g/L MCPA ester) formulated as an emulsifiable concentrate.

Platinum adjuvant container size: 6.4 L

Crops:

Spring wheat (including durum).

Weeds Controlled and Staging:

Weeds controlled up to 4 leaf stage:

American nightshade, ball mustard, bluebur, cocklebur, cow cockle, flixweed, green smartweed, kochia[1], lady's-thumb, night-flowering catchfly, pale smartweed, redroot pigweed, Russian thistle[1], scentless chamomile[2], shepherd's-purse, volunteer sunflower, volunteer rapeseed (including canola).

[1] Spray before plants are 2 inches (5 cm) high.
[2] Spring seedlings only.

Weeds controlled up to 5 leaf stage:
Green foxtail (up to emergence of 3rd tiller).

Weeds controlled up to 6 leaf stage:
Wild oats (prior to emergence of 4th tiller), wild tomato.

Weeds controlled up to 8 leaf stage:
common groundsel, common ragweed, lamb's quarters, stinkweed, tame buckwheat, tartary buckwheat, wild buckwheat, wild mustard, wormseed mustard.

Weeds with top growth controlled:
Canada thistle, perennial sow-thistle.

Crop Stage:

From 2 leaf up to emergence of 4th tiller.

Cost:

$21.70/acre (1999 suggested retail price).

Rates:

0.092L/acre Horizon (1 jug treats 20 acres) + 0.322L/acre Score

0.405L/acre Buctril M (1 jug treats 20 acres).

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

At least 40 L/acre (9 gallons/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan stainless steel nozzles tilted forward at an angle of 45°.

How it Works:

Clodinafop is a systemic herbicide which causes yellowing of leaves and growing points 1-3 weeks after application and death after 3-5 weeks. Bromoxynil is a contact herbicide and so good coverage is essential. Susceptible weeds turn brown and die in 3-5 days. MCPA is a systemic herbicide which may cause burn spots within hours of application and death within 14 days.

Effects of Growing Conditions:

For optimum results, apply to actively growing weeds and in humid conditions. Do not apply to crops or weeds that are stressed due to drought, frost, water logging, infertile conditions or disease or insect damage.

Tank Mixes:

Herbicides: Refer to individual labels for registered tank mixes.

Insecticides: None registered.

Fungicides: None registered.

Restrictions:

Rainfall: Within 1 hour may reduce control.

Grazing: Do not graze treated crops or cut for feed within 30 days of application.

Recropping: No restrictions the year after treatment.

Aerial application: Do not apply by air.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Mixing Instructions:

Add Buctril M first, followed by Horizon 240 EC with the Platinum adjuvant added last.

Tank Cleaning:

Thoroughly clean application equipment immediately after spraying. Ensure that all traces of the product are removed by draining and flushing tank walls with clean water for 10 minutes. Remove nozzles and screens and wash separately.

Do not clean equipment upslope of water bodies or ditches, cropland or shelterbelts. Clean equipment away from where others may frequent.

Hazard Rating:

Warning Poison.

Skin and Eye Irritant.

Poast Ultra

Herbicide Group – 1
(Refer to page 16)

Company:

BASF Canada Inc.

Formulation:

Poast Ultra - 450 g/L sethoxydim formulated as an emulsifiable concentrate.

Container size - 7.7 L jug of Poast Ultra and 2 x 8.1 L jugs of Merge.

Crops:

To a maximum rate of 0.45 L/acre - Canola, potatoes, dry beans (white, kidney, pinto, adzuki, mung), dry field peas, lentil, seed production of creeping red fescue, flax, soybeans, fababeans, alfalfa, and established stands of alsike clover, cicer milkvetch, sainfoin, and sweet clover.

To a maximum rate of 0.26 L/acre - low linolenic acid varieties of flax, safflower, dill, caraway, coriander, and seedling alsike clover, cicer milkvetch, sainfoin, and sweet clover.

To a maximum rate of 0.19 L/acre - chickpea.

To a maximum rate of 0.23 L/acre - tame buckwheat.

Crop Stage:

Creeping red fescue and broadleaf crops are tolerant at all growth stages. However, the preharvest interval outlined in the "Restrictions:" section must be followed to avoid unacceptable residues of sethoxydim in harvested crops. When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

1 to 6 leaf stage of annual grasses.

1 to 4 leaf stage (best results prior to tillering) of wild oats, volunteer wheat and volunteer barley at the 0.32 L/acre rate. Optimum yield response occurs when weeds are controlled early.

Quackgrass - 1 to 3 leaf stage.

Foxtail barley - prior to tillering.

Cost:

$11.50 to $40.59/acre (1999 suggested retail prices).

Weeds Controlled and Rates:

WEED	RATE (L/ACRE)	ACRES TREATED PER 7.7 L CONTAINER
Green or yellow foxtail, barnyard grass, Persian darnel, proso millet, witchgrass and volunteer corn	0.13	60
Wild oats	0.13[1] or 0.19	60 or 40
Volunteer wheat, oats and barley	0.13[1] or 0.19	60 or 40
Quackgrass suppression	0.19	40
Quackgrass (season long control)	0.45	17
Foxtail barley suppression	0.45	17

[1] The low rate must only be used in canola, flax and peas under ideal growing conditions (adequate moisture, good fertility and moderate temperatures - 15 to 28°C). Do not apply under stress conditions.

Merge should be added at rates of 0.20 to 0.40 L/acre when using water volumes of 5 to 10 gallons/acre (23 to 45 L/acre). When using water volumes of 10 gallons/acre (45 L/acre) or higher, add Merge at a rate of 0.40 L/acre. When spraying quackgrass and foxtail barley, Merge should be added at 0.40 to 0.80 L/acre.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 20 gallons/acre (23 to 90 L/acre). Use a minimum of 10 gallons/acre (45 L/acre) if crop or weed growth is dense, and when spraying quackgrass. Use 5 to 10 gallons/acre (23 to 45 L/acre) when using the 0.32 L/acre rate for wild oats, volunteer wheat and volunteer barley.

Pressure:

275 to 300 kPa (40 to 45 psi).

Nozzles:

Stainless steel 80° or 110° flat fan nozzles tilted forward at an angle of 45°.

How it Works:

Poast Ultra is a systemic and a contact herbicide. It is absorbed through treated leaves and translocated to growing points. Susceptible grassy weeds turn yellow and then brown, with plant death occurring in 7 to 21 days. In quackgrass, Poast Ultra is translocated to the rhizomes where it kills actively growing rhizome buds, as well as above-ground foliage. Dormant rhizome buds will remain unaffected by Poast Ultra and regrowth can occur from these buds. Regrowth is usually apparent 6 to 8 weeks after treatment.

Effects of Growing Conditions:

Most effective control will be achieved when grasses are actively growing. Do not apply to grasses stressed more than 20 days because of lack of moisture. Control may be reduced if temperatures are below 15°C. Retillering may occur under stress conditions or if fertility is low.

Tank Mixes:

Herbicides: The following tank mixes can be applied with 0.13 to 0.18 L/acre of Poast Ultra. Include Merge at 0.3 to 0.4 L/acre with all mixes.

In Flax, Poast Ultra may be tank mixed with:
Buctril M (0.405 L/acre) (including low linolenic acid varieties)
Lontrel 360 (0.23 to 0.34 L/acre)
Lontrel 360 (0.23 to 0.34 L/acre) + MCPA Ester (0.34 to 0.45 L/acre of 500 g/L formulations)
MCPA Ester (up to 0.45 L/acre of 500 g/L formulations)
The above tank mixes may reduce grass control, especially under adverse weather conditions.

In canola, Poast Ultra may be tank mixed with the following herbicides.
Lontrel (0.17 to 0.19 L/acre)
Muster (8 to 12 g/acre)
Lontrel (0.17 L/acre) + Muster (8 g/acre) (Poast Ultra at 0.13 L/acre only)

In field peas and SMART canola, Poast Ultra at 0.19 L/acre plus Merge at 0.16 L/acre may be tank mixed with the following herbicides:
-Pursuit at 0.04 L/acre to control chickweed, cleavers, hemp-nettle (peas only), redroot pigweed (light infestations only), smartweed, stinkweed, volunteer canola (non-Smart varieties), wild buckwheat (light infestations only), and wild mustard. The company does not provide guidelines for weed densities under light infestations. When in doubt, use the higher rate below or contact your local BASF Representative.
-Pursuit (0.085 L/acre) for all weeds listed on the Pursuit label.
Check label directions for mixing order and additional timing restrictions for broadleaf partners.

Allow 4 days between application of Poast Ultra and application of herbicides other than those registered for tank mixing. Allow 5 days between application of Sencor and application of Poast Ultra.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour of application may reduce control.

Grazing: Do not graze the treated crop or cut for feed prior to crop maturity. Forage legumes may be cut after the specified preharvest interval.

Preharvest Interval: 30 days for forage legumes; 60 days for dry peas, flax; 65 days for lentils and chickpeas; 70 days for canola, chickling vetch and alfalfa; 80 days for potatoes, dry beans, soybeans, fababeans; 86 days for low linolenic acid varieties of flax; 90 days for safflower.

Recropping: Do not sow cereal or grass crops within 14 days of Poast Ultra application.

Aerial Application: May be applied by air in 2.2 to 4.4 gallons/acre (10 to 20 L/acre). Merge should be added at rates of 0.10 to 0.20 L/acre.

Storage: May be frozen.

Tank Cleaning:

When finished spraying Poast Ultra, run clean water through the tank, pump and lines. Drain. Refill sprayer with clean water and 1 L of household ammonia (3 percent) per 100 L of water. Circulate the solution through lines and nozzles. Let solution sit in the tank for several hours (preferably overnight). Scrub inside surfaces of tank, but do not enter the spray tank. Flush sprayer system with water until thoroughly clean. Remove and clean nozzles and screens.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Prestige

Herbicide Group – 4
(Refer to page 16)

Company:

Dow AgroSciences.

Formulation:

Prestige A: 180 g/L fluroxypyr. Container size – 6.4 L.

Prestige B: 50 g/L clopyralid and 280 g/L MCPA ester formulated as an emulsifiable concentrate.

Container size – 2 x 8.0 L.

Crops:

Spring wheat (not including durum) and barley.

Weeds Controlled and Staging:

Annual sow-thistle
Canada thistle[1]
Cleavers (1-4 whorls)
Common groundsel
Dandelion[2]
Flixweed[2]
Kochia
Lamb's-quarters
Perennial sow-thistle[1]
Redroot pigweed
Round leaved mallow
Russian pigweed
Scentless chamomile
Shepherd's-purse
Smartweed
Stinkweed
Stork's-bill (1-8 leaf)
Tartary buckwheat
Volunteer canola
Volunteer flax (1-12 cm)
Volunteer sunflower
Wild buckwheat (1-4 leaf)
Wild mustard

Weeds Suppressed:

Chickweed
Hemp-nettle (2-6 leaf stage)

[1] Spray when 4-6 inches (10-15 cm) high. Season long control, with some regrowth in the fall.
[2] spring rosettes only.

Unless otherwise stated, weeds should be sprayed in the 2 to 4 leaf stage.

Cleavers and chickweed should be sprayed as late as possible (within recommended stages) to ensure the majority of the weed flushes have emerged.

Crop Stage:

3 leaf to just before the flag leaf stage.

Cost:

$14.65 per acre (1999 suggested retail price).

Rates:

Prestige A: Apply at 0.32 L/acre
Prestige B: Apply at 0.8 L/acre
One case of Prestige will treat 20 acres.

Water Volume:

10 gal/acre (45 L/acre)

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan nozzles tilted forward at a 45° angle.

How it Works:

The components of Prestige move within the plant to control exposed and underground plant tissues. They mimic naturally occurring plant hormones, and control weeds by disrupting normal plant growth patterns. Injury symptoms include epinasty (twisting of the stem) and swollen nodes.

Effects of Growing Conditions:

The activity of the Prestige is influenced by weather conditions. The temperature range for optimum activity is 12°C to 24°C. Reduced activity will occur when temperatures are below 8°C or above 27°C. Frost 3 days before or after application may reduce weed control and crop tolerance. Weed control may be reduced during stress conditions (drought or heat stress) or if heavy infestations exist.

Tank Mixes:

Herbicides: In spring wheat (not including durum) and barley, Prestige may be tank mixed with Achieve 80 DG (0.1 kg/acre).

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 6 hours of post-emergent application may result in reduced weed control.

Grazing: Do not permit lactating dairy animals to graze treated fields within 7 days of application. Wait 30 days to cut the crop for forage, or to cut hay that has been treated with Prestige. Withdraw meat animals from treated fields at least 3 days before slaughter.

Preharvest: Wait 60 days after application before harvesting the crop.

Recropping: Wheat, oats, barley, rye, flax, canola and mustard may be seeded the year following Prestige application. Do not seed crops other than those listed above for at least 1 year following Prestige application.

Aerial Application: Do not apply by air.

Storage: Store product in original containers in a secure, dry, heated area. If the product is frozen, bring to room temperature and agitate before use.

Tank Cleaning:

Drain tank and hose down interior surfaces. Flush tank, hoses, boom, and nozzles with clean water for 10 minutes.

Fill the tank with water and circulate for 15 minutes. Spray part of the mixture through the hoses, boom and nozzles. Drain the tank. Remove and clean the nozzles and screens separately. If the spray equipment is to be used to spray crops other than cereals, repeat the above process and thoroughly wash the spray mixture from the outside of the spray tank and the boom.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent.

Hazard Rating:

Danger Poison.

Warning Eye Irritant.

Caution Skin Irritant.

Prevail

Herbicide Group – 1, 4

(Refer to page 16)

Company:

Dow AgroSciences.

Formulation:

The Prevail package contains 4 containers: 1 labelled "Prevail A," 2 labelled "Prevail B" and 1 labelled "Prevail C." "Prevail A" contains 80 percent tralkoxydim formulated as a dispersible grain. Container size - 2 kg. "Prevail B" contains 50 g/L clopyralid plus 280 g/L MCPA ester formulated as an emulsifiable concentrate. Container size - 8 L. "Prevail C" contains adjuvant. Container size - 4 L.

Crops:

Spring wheat (including durum), barley.

Weeds Controlled:

Annual sow-thistle
Canada thistle[1]
Dandelion[3]
Flixweed[3]
Green foxtail
Kochia (suppression)
Lamb's-quarters
Persian darnel
Perennial sow thistle[2]
Redroot pigweed
Scentless chamomile
Shepherd's-purse[3]
Smartweed
Stinkweed[3]
Tartary buckwheat
Wild buckwheat
Wild mustard
Wild oats
Volunteer canola

[1] Season long control, some regrowth may occur in the fall.
[2] Top growth control only.
[3] Spring rosettes only.

Crop Stage:

Wheat and barley - 3 to 6 leaf stage.

Weed Stage:

Apply at the 1 to 6 leaf stage of wild oats (total leaves including tillers) with a maximum of 2 tillers. Apply at the 1 to 5 leaf stage of green foxtail (total leaves including tillers) with a maximum of 1 tiller. Apply at the 2 to 3 leaf stage of annual grasses for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Broadleaf weeds - 1 to 4 leaf stage, except scentless chamomile and kochia which are to be treated in the 2 to 4 leaf stage.

Canada thistle - Apply after all the thistles have emerged and are 4 inches (10 cm) tall but prior to bud stage.

Cost:

$26.40 per acre (1999 suggested retail price).

Rate:

The Prevail package will treat 20 acres.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan nozzles. All strainer and nozzle screens must be 50 mesh or coarser.

How it Works:

Tralkoxydim is translocated quickly to growing points and young leaves of plants. Growth of green foxtail and wild oats stops almost immediately, and yellowing is visible within one week. Clopyralid and MCPA are growth regulator type herbicides which are absorbed through leaves and stems and are translocated to all parts of the plant. Symptoms include swollen growing points and roots, twisted stems and leaves, and a gradual discoloration from green to yellow to brown. Susceptible plants die in 2 to 3 weeks.

Effects of Growing Conditions:

Unacceptable crop injury (crop yellowing, stunting) can occur if Prevail is applied when temperatures of 5°C or below occur within 48 hours of application. Do not apply Prevail if the crop is under stress from extreme drought or excessive moisture conditions. Weed control could be reduced if weeds are stressed because of drought, flooding or prolonged hot or cool temperatures.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Allow a minimum 7 day interval between the application of Prevail and any other pesticide. Apply Prevail 7 days before any other herbicide.

Restrictions:

Rainfall: Within 6 hours may reduce control.

Grazing: Do not graze treated crops or cut for livestock feed. Do not feed straw treated with Prevail.

Preharvest: Do not apply within 60 days of harvest.

Recropping: Wheat, barley, oats, rye, corn, flax, canola, mustard, and forage grasses may be seeded the following year. Do not seed peas, lentils, sunflowers, beans, alfalfa, or clover crops the following year.

Aerial application: Do not apply by air.

Storage: If any component is frozen, bring to room temperature and agitate.

Tank Cleaning:

When spraying is completed, thoroughly rinse the tank with clean water to remove any residues. The addition of a detergent or Agral 90, Agsurf will enhance removal of any residues in the tank.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison
Warning Eye and Skin Irritant

Primextra Light

Herbicide Group – 15, 5
(Refer to page 16)

Company:

Novartis Crop Protection

Formulation:

330 g/L of metolachlor + 170 g/L of atrazine formulated as a liquid. Container size - 10 L.

Crops:

Corn

Weeds:

American nightshade
Barnyard grass
Buckwheat
Eastern black nightshade
Green foxtail
Lady's-thumb
Prostrate pigweed
Purslane
Ragweed
Redroot pigweed
Smartweed
Wild mustard
Yellow foxtail
Yellow nutsedge[1]

[1] Herbicide must be incorporated for best control.

Crop Stage:

Preplant incorporated.

Pre-emergence if irrigated within 10 days of application.

Weed Stage:

Pre-emergence.

Cost:

$19.74 to $26.04/acre (1999 suggested retail price).

Rates:

WEED POPULATIONS	RATE (L/ACRE)	ACRES TREATED PER 10 L CONTAINER
Light infestations	2.35	4.3
Medium infestations	2.7	3.7
Heavy infestations	3.1	3.2

Water Volume:

15 gallons/acre (70 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan with 50-mesh nozzle screens.

Incorporation:

Incorporate using S-tine or C-tine cultivators or tandem disk. Do not incorporate deeper than 4 inches (10 cm).

To ensure that the product remains in the top 2 inches (5 cm) of soil, apply to a firm seedbed free of large clods or lumps. If using tandem disks, set disks to work the soil at a depth of 4 inches (10 cm) and operate at a speed of 4 mph (6 km/hr). If using an S-tine cultivator, set the implement to work the soil to a depth of 4 inches (10 cm) and operate at a speed of 6 mph (10 km/hr).

How it Works:

Primextra Light contains both atrazine and metolachlor. Atrazine is a systemic herbicide which is absorbed by roots and foliage. Photosynthesis is blocked. Control may not be noticeable for 7 to 10 days after treatment. Metolachlor inhibits the germination of weeds, particularly grasses.

Effects of Growing Conditions:

Extended periods of dry soil conditions may result in reduced weed control. Moderate rainfall after application will enhance activity. Heavy rainfall following application of Primextra Light may dilute the metolachlor deeper than 2 inches (5 cm) and result in reduced weed control, particularly on light textured soils.

Tank Mixes:

Herbicides: None registered.

Fertilizers: May be tank mixed with liquid fertilizer for preplant incorporated applications. Conduct a compatibility test by performing a jar test prior to mixing the products in the tank. May be impregnated onto dry bulk fertilizers (except nitrate or superphosphate fertilizers).

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Moderate rainfall shortly after application will enhance activity. Heavy rainfall reduces weed control by leaching the chemical out of the top few centimetres of soil. Inadequate rainfall after application (within 10 days) will cause reduced weed control.

Grazing: Do not graze or cut corn for feed before ear emergence.

Recropping: This product contains Atrazine. All crops except corn and triazine-tolerant canola may be affected the year following the use of Atrazine. Other more sensitive crops may be affected two or more growing seasons after application.

Aerial Application: Do not apply by air.

Storage: Store in a dry place.

Environment: Do not mix or load this product within 30 m, or apply within 10 m, of any wells, lakes, streams, ponds, dugouts or sink holes.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating

Keep out of reach of children.

Princep Nine-T/Simazine 480/ Simazine 80W

Herbicide Group – 5

(Refer to page 16)

Company:

Novartis Crop Protection (Princep Nine-T)

United Agri Products (Simazine 480, Simazine 80W)

Formulations:

Princep Nine-T - 90 percent simazine formulated as a water dispersible granular. Container size - 5 kg.

Simazine 80W - 80 percent simazine formulated as a wettable powder. Container size - 4 kg.

Simazine 480 - 474 g/L simazine formulated as an emulsifiable concentrate. Container size - 9.46 L.

Crops:

Established alfalfa (Princep Nine-T).

Established bird's-foot trefoil (Princep Nine-T, Simazine 80W)

Established shelterbelts (elm, caragana, green ash, Manitoba maple).

Weeds:

Barnyard grass
Lamb's-quarters
Lady's-thumb
Perennial species starting from seed
Purslane
Ragweed
Smartweed
Volunteer clovers
Wild Buckwheat
Wild oats
Yellow foxtail

Crop Stage:

Established forage crops: do not use in year of seeding. Apply after September 1, but before freeze-up.

Established shelterbelts: fall or early spring before weeds begin growth. Do not apply to frozen ground.

Weed Stage:

Pre-emergence in forage crops and shelterbelts.

Cost:

Forage crops: $6.20 - $7.14 per acre
Shelter belts: $27.56 to $59.50 per acre
(1999 suggested retail price).

Rates:

In forage crops, Princep Nine-T - 0.45 kg/acre.

Simazine 80W - 0.51 kg/acre.

Shelterbelts - Princep Nine-T - 2 to 3 kg/acre, Simazine 480 - 3.8 to 5.67 L/acre, Simazine 80W - 2.2 to 3.3 kg/acre.

Water Volume:

30 gallons/acre (135 L/acre). In shelterbelts, use a minimum of 50 gallons/acre (225 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan nozzles with 50 mesh or coarser nozzle screens.

How it Works:

Simazine is a systemic herbicide which is absorbed by roots. Photosynthesis is blocked.

Effects of Growing Conditions:

When applying to forage stands, dry soil conditions at the time of weed emergence may result in reduced weed control.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Moderate rainfall after application enhances activity.

Grazing: In forage stands, allow 30 days between application and grazing, 60 days between application and cutting for feed.

Recropping: Do not sow treated fields to any crop the year after application.

Aerial Application: Do not apply by air.

Storage: May be frozen. Store in a cool, dry place.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison (Simazine 480)

Prism

Herbicide Group – 2

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

25 percent rimsulfuron formulated as a dry flowable. Container size - 480 g.

Crops:

Irrigated potatoes. Potato tolerance to Prism differs by variety. Limit first use of Prism to a small area of each variety prior to adoption as a field practice.

Weeds:

Barnyard grass
Green foxtail
Lamb's-quarters (suppression only)
Quackgrass
Redroot pigweed
Yellow foxtail

Crop Stage:

Prior to initiation of flowering.

Weed Stage:

Annual grasses - 1 to 6 leaf stage, maximum 2 tillers. Quackgrass - 3 to 6 leaf stage (less than 10 inches or 25 cm leaf extended). Redroot pigweed and lamb's quarters - 4 to 6 leaf stage (less than 4 inches or 10 cm tall or across).

Cost:

$18.58/acre (plus adjuvant cost) (1999 suggested retail price).

Rates:

0.024 kg/acre. Add a recommended non-ionic surfactant such as Citowett Plus, Agsurf, or Agral 90 at 0.2 L per 100 L spray solution. 1 container treats 20 acres. Delay cultivation for 7 to 10 days after application. Make only one application per growing season.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

175 to 275 kPa (25 to 40 psi).

Nozzles:

Flat fan. 50 mesh screens or coarser.

How it Works:

Prism is absorbed primarily through the foliage. Plant growth stops almost immediately, but symptoms may not be visible for 1 to 2 weeks.

Effects of Growing Conditions:

Apply Prism when the temperature 24 hours before and after application is between 5°C and 28°C. Temperatures beyond this range increase the potential for crop injury. Rapid fluctuations in temperature will stress the crop (greater than a 20°C difference within 24 to 36 hours). Allow 48 to 72 hours for the crop to acclimatize before spraying Prism if severe temperature fluctuations occur. Crop injury may result if applications are made when potatoes are stressed by abnormally hot, humid, or cold weather conditions, frost, low fertility, drought, water saturated soil, compacted soil, previous pesticide applications, disease or insect damage. If potatoes have been injured by frost, wait 48 to 72 hours before applying Prism.

Warm, moist conditions after application promote good weed control with Prism while cool and/or dry conditions may reduce or delay activity. Weeds hardened off by cold weather or drought stress may not be controlled.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered. Do not apply a foliar organophosphorus insecticide for 7 days before or after applying Prism.

Restrictions:

Rainfall: Within 2 to 4 hours of application may reduce weed control.

Preharvest: Do not apply within 30 days of harvest.

Recropping: Spring barley, soybeans, white beans, red clover, sorghum, potatoes and field corn may be planted the year after application. Winter wheat may be planted 4 months after application. For all other crops, a field bioassay is recommended before planting.

Aerial application: Do not apply by air.

Storage: May be frozen.

Environment: Do not apply in areas where surface water from the treated area can run off to adjacent cropland, streams, irrigation water or wells. Leave a buffer of 10 m from the last spray pass and wetland areas or bodies of water. Leave a buffer of 5 m from the last spray pass and woodlots or shelterbelts.

Tank Cleaning:

Do not clean equipment near desirable trees or other plants. Do not contaminate water sources. Drain tank, hose down tank interior and flush clean water through hoses for a minimum of 5 minutes. Add water and houshold ammonia (1 L of 3 percent household ammonia per 100 L water) to spray tank. Flush hoses and nozzles, and add water to fill tank. Circulate cleaning solution for 15 minutes, and flush through boom again. Wash nozzles and screens in water/ammonia mix in pail. Repeat above tank and hose cleaning procedure. Rinse system with clean water for 5 minutes. Prior to using sprayer for next application, flush system with fresh water for 5 minutes.

Hazard Rating:

Warning Eye Irritant

Puma

Herbicide Group – 1

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

92 g/L fenoxaprop-p-ethyl formulated as an emulsifiable concentrate. Container size - 8.1 L. (one case contains 2 x 8.1 L jugs).

Crops:

Spring wheat (including durum). Durum wheat - early application is important to maintain crop safety. Temporary crop shortening and discolouration may be observed with applications of Puma to durum wheat. This is more likely to occur when Puma is used alone (not in a tank mix) or when applied past the 6 leaf stage.

Weeds:

Wild oat, green foxtail, barnyard grass.

Crop Stage:

Apply to wheat that has a minimum of 1 leaf to a maximum of 6 leaves on the main stem plus 3 tillers. Application beyond this stage may result in injury to spring and durum wheat.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Apply when the annual grassy weeds are in the 1 to 6 leaf stage of growth with a maximum of 2 tillers.

Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Cost:

$7.90 to $15.82/acre (1999 suggested retail price).

Rates:

Apply at 0.405 L/acre (one case treats 40 acres). At low wild oat populations and when applying Puma alone, Puma may be applied at 0.35 L/acre (one case treats 46 acres). The company does not specify the wild oat densities considered to be low wild oat populations. Control at the 0.35 L/acre rate will be influenced by factors such as crop competition and growing conditions. Refer to the "Yield Losses Caused by Weeds" section in this guide for information on crop yield losses at different wild oat densities. For control of green foxtail only, when applying Puma alone, Puma may be applied at 0.20 L/acre (one case treats 80 acres).

Water Volume:

Ground equipment: 5 to 10 gallons/acre (23 to 45 L/acre).

Aircraft: not less than 3 gallons/acre (15 L/acre).

Pressure:

Ground equipment: 275 kPa (40 psi).

Aircraft: 300 kPa (42 psi).

Nozzles:

Ground equipment: 80° or 110° stainless steel flat fan nozzles tilted forward at a 45° angle.

Aircraft: use nozzles that provide coarse droplet size distribution (400-800 microns).

How it Works:

Puma is a systemic herbicide that is translocated from treated leaves to growing points within plants. Symptoms include reduced leaf growth and chlorosis (yellowing) of treated leaves within 3 to 7 days. Chlorosis progresses and plant death occurs 14 to 21 days after application.

Effects of Growing Conditions:

When daytime temperatures before or after application are very hot combined with dry conditions and low humidity, plants are under stress. During periods of stress, plants are not actively growing and reduced control may result.

Tank Mixes:

Herbicides: The following products may be tank mixed with 0.405 L/acre Puma:
MCPA ester or amine (500 g/L) (0.34 L/acre)
Buctril M (0.405 L/acre)
Curtail M (0.80 L/acre)
Estaprop (0.71 L/acre)
Lontrel (0.17 L/acre)
Lontrel (0.17 L/acre) with MCPA ester (500 g/L) (0.34 L/acre)

Lontrel (0.11 L/acre) with MCPA ester (500 g/L) (0.34 to 0.45 L/acre)
Refine Extra (0.008 kg/acre)
Refine Extra (0.008 kg/acre) with MCPA ester (500 g/L) (0.34 L/acre)
2,4-D LV ester (700 g/L) (0.24 L/acre)

2,4-D LV ester (600 g/L) (0.28 L/acre)

Ally (0.002 to 0.003 kg/acre. Consult Ally label for application timing and recropping restrictions.

In spring wheat only (NOT including durum): Attain A at 0.24 L/acre and Attain B at 0.405 L/acre. Consult Attain label for proper application timing.

Fertilizers: None registered.

Insecticides: None registered.

Note: An interval of 7 days prior to application, or 4 days after application of Puma, is required before any other pesticide can be applied, unless registered in a Puma tank mix.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour may result in reduced control.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Preharvest: Do not apply within 65 days of harvest.

Recropping: No restrictions the year after application.

Aerial Application: DO NOT apply if the windspeed is greater than 9 mph (15 kph). DO NOT apply when temperature is greater than 25°C AND the relative humidity is less than 30 percent.

Storage: Do not freeze.

Environment: Do not apply within 15 m of a body of water or wetland area.

When applying by air, leave a buffer zone of 37 m between the edge of the last spray swath and non-target terrestrial habitats including forested areas, shelterbelts and woodlots; leave a buffer zone of 21 m between the edge of the last spray swath and non-target wetlands, eg. sloughs, ponds.

Tank Cleaning:

Before and after using Puma, complete a thorough cleaning of the spray tank, lines and filter. This is especially important as the previously sprayed product may cause injury to the crop you intend to spray. The manufacturer recommends that all traces of Puma be removed from mixing and spraying equipment by flushing with a water/household ammonia mixture.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison
Skin and Eye Irritant

Puma OnePass

Herbicide Group – 1,6

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

Each case treats 20 acres and contains an 8.1 L jug of One Pass (92 g/L fenoxaprop-p-ethyl formulated as an emulsifiable concentrate) and an 8 L jug of Buctril M (280 g/L bromoxynil and 280 g/L MCPA ester formulated as an emulsifiable concentrate).

Crops:

Spring wheat (including durum)

Weeds Controlled and Staging:

Broadleaf weeds controlled up to 4 leaf stage:
American nightshade, ball mustard, bluebur, cocklebur, cow cockle, flixweed, green smartweed, kochia[1], lady's-thumb, night-flowering catchfly, pale smartweed, redroot pigweed, Russian thistle[1], scentless chamomile[2], shepherd's-purse, volunteer canola, volunteer sunflower.

Broadleaf weeds controlled up to 6 leaf stage:
Wild tomato

Broadleaf weeds controlled up to 8 leaf stage:
common groundsel, common ragweed, lamb's-quarters, stinkweed, tame buckwheat, tartary buckwheat, wild buckwheat, wild mustard, wormseed mustard.

Top growth control of the following broadleaf weeds:
Canada thistle, perennial sow-thistle

Annual grass weeds controlled up to the leaf stage (up to emergence of 3rd tiller):
Barnyard grass, green foxtail, wild oat

[1] spray before plants are 2 inches (5 cm) high
[2] spring annual only

Crop Stage:

Apply when wheat has a minimum of 1 leaf to a maximum of 6 leaves on the main stem, plus 3 tillers. Treatment at the 3-4 leaf stage of grass weeds usually maximizes crop tolerance and weed control.

Cost:

$21.50/acre (1999 suggested retail price)

Rates:

0.40 L/acre One Pass plus 0.40 L/acre Buctril M.

Water Volume:

5-10 gal/acre (23-45 L/acre)

Pressure:

275 kPa (40 psi)

Nozzles:

80° or 110° flat fan tilted forward at a 45° angle. Do not use flood jet nozzles, controlled droplet application equipment or Sprafoil (Spray-air) equipment.

How it Works:

One Pass is a systemic herbicide that causes reduced growth and leaf chlorosis (yellowing) within 3-7 days after treatment of susceptible grass weeds. Plants die 14-21 days after application. Bromoxynil is a contact herbicide that requires good coverage. Susceptible weeds turn brown and die in 3-5 days. MCPA is a systemic herbicide which causes some burning within hours and plant death within 14 days.

Effects of Growing Conditions:

Crop injury or reduced weed control may result when applications are made to plants stressed by hot/dry conditions, frost, waterlogging, disease or insect damage.

Tank Mixes:

Herbicides: None registered

Fertilizer: None registered

Insecticides: None registered

Wait 7 days after application of another pesticide before applying Puma One Pass. Wait 4 days after applying Puma One Pass before applying another pesticide.

Restrictions:

Rainfall: Do not apply if rain is expected within 1 hour of spraying.

Grazing: Do not graze or cut hay from treated crops.

Preharvest: Do not apply within 65 days of harvest

Recropping: No restrictions.

Aerial Application: Do not apply by air.

Storage: Do not freeze One Pass. Buctril M may be frozen.

Environment: Do not apply within 15 m of a water body or wetland area.

Tank Cleaning:

Before and after using Puma One Pass, complete a thorough cleaning of the spray tank, lines, and filters. This is especially important, since the previously sprayed product may cause injury to the crop you intend to spray.

The manufacturer recommends flushing spray equipment with water/ammonia mixture to remove Puma One Pass after application.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent.

Hazard Rating:

Warning Poison.

Puma^{120} Super

Herbicide Group – 1
(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

120 g/L fenoxaprop-p-ethyl formulated as an emulsifiable concentrate. Container sizes – 6.2 L, 99.3L

Crops:

Spring wheat (including durum) and barley

Weeds:

Wild oat, green foxtail, barnyard grass.

Crop Stage:

Apply to wheat that has a minimum of 1 leaf to a maximum of 6 leaves on the main stem plus 3 tillers. Apply to barley at 1 leaf to a maximum of 5 leaves on the main stem plus 2 tillers. Treatment at the 3-4 leaf of crops and weeds will maximize crop tolerance and weed control. Temporary crop injury such as shortening or discolouration may be observed after application. Such injury is more likely to occur in barley and also when Puma^{120} Super is applied outside recommended stages.

Weed Stage:

Apply when annual grass weeds are in the 1 to 6 leaf stage up to emergence of 3rd tiller. Optimal staging is from 2 to 4 leaves.

Cost:

$7.90-$15.82 (1999 suggested retail price)

Rates:

WEEDS CONTROLLED	RATE	AREA TREATED PER:	
		6.2 L/CONTAINER	99.3 L/CONTAINER
Green foxtail only	0.154 L/acre	40.5	645
Low wild oat infestations	0.268 L/acre	23.1	370
Moderate-heavy wild oat infestations, barnyard grass, green foxtail	0.308 L/acre	20.1	322.5

Water Volume:

Wheat: 5-10 gal/acre (23-45 L/acre)

Barley: a minimum of 10 gal/acre (45 L/acre).

Pressure:

40 psi (275 kPa)

Nozzles:

80° or 110° flat fan nozzles tilted forward at a 45° angle. Do not use flood jet nozzles, controlled droplet application equipment or Sprafoil (Spray-air) equipment.

How it Works:

Puma^{120} Super is a systemic herbicide that is translocated from the leaves to the growing points within the plant. Symptoms include reduced growth and chlorosis (yellowing) of treated leaves within 3 to 7 days. Chlorosis progresses and plant death occurs 14 to 21 days after application.

Effects of Growing Conditions:

DO NOT apply Puma^{120} Super 2-3 days prior to, or following, temperatures of 3°C or lower as crop injury may occur.

Under stressful conditions (hot/dry, waterlogging, disease or insect damage) or heavy crop canopy, early application will improve weed control.

Tank Mixes:

Herbicides:
Spring wheat (not including durum)
Attain – "A" (0.24 L/acre) and "B" (0.40 L/acre)
Prestige – "A" (0.32 L/acre) and "B" (0.80 L/acre)

Spring and durum wheat:
2,4-D Ester LV 600 – 0.28 L/acre
2,4-D Ester LV 700 – 0.24 L/acre
Ally – 2-3 g/acre
Buctril M – 0.40 L/acre
Curtail M–0.80 L/acre
**DyVel – 0.50 L/acre
**DyVel DS – 0.44 L/acre
Estaprop – 0.70 L/acre
**Express Pack – "Express" (4 g/acre) + 2,4-D Ester LV 700 (0.24 L/acre)
Lontrel 360 – 0.168 L/acre
*Lontrel 360 (0.168 L/acre) + MCPA Ester*** 500 g/L (0.336 L/acre)
*Lontrel 360 (0.112 L/acre) + MCPA Ester*** 500 g/L (0.336 – 0.448 L/acre)
MCPA Ester 500 g/L – 0.336L/acre
MCPA Amine 500 g/L – 0.336 L/acre
*Mecoprop – 2.2 – 2.8 L/acre
Refine Extra – 8 g/acre
Refine Extra (8 g/acre) + MCPA Ester*** 500 g/L (0.336 L/acre)
Thumper – 0.40 L/acre
Unity – "280 EC" (0.20 L/ac) + "75 WG" (4.28 g acre)

Barley:
Ally - 2-3 g/acre
Buctril M – 0.4 L/acre
Curtail M – 0.6-0.8 L/acre
**DyVel – 0.5 L/acre
*Estaprop – 0.7 L/acre
**Express Pack – "Express" (4 g/acre) + 2,4-D Ester LV 700 (0.24 L/acre)
MCPA Amine 500 g/L – 0.336 L/acre
MCPA Ester 500 g/L – 0.336 L/acre
Prestige – "A" (0.32 L/acre) + "B" (0.80 L/acre)
Refine Extra – 8 g/acre
Refine Extra (8 g/acre) + MCPA Ester*** 500 g/L (0.336 L/acre)
Thumper – 0.8 L/acre
Unity – "280 EC" (0.20 L/acre) + "75 WG" (4.28 g/acre)

*use only at the high rate of Puma^{120} Super
**use only at the green foxtail rate of Puma^{120} Super
***use 500 g/L Ester formulations only

Fertilizers: None registered

Insecticides: None registered

Note: Leave an interval of 7 days prior to application or 4 days after application of Puma^{120} Super, when applying any pesticide that is not registered as a tank mix.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour may reduce control.

Grazing: Do not graze or cut for hay, crops that have been treated with Puma^{120} Super.

Preharvest: Do not apply within 65 days of harvest.

Recropping: No restrictions in the year after application. Only one application may be made per year.

Aerial Application: Do not apply by air

Storage: Do not freeze.

Environment: Do not apply within 10m of a body of water or wetland.

Tank Cleaning:

Before and after using Puma^{120} Super, complete a thorough cleaning of the spray tank, lines, and filters. This is especially important, since the previously sprayed product may cause injury to the crop you intend to spray.

The manufacturer recommends flushing spray equipment with a water/ammonia mixture to remove Puma^{120} Super after application.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent.

Hazard Rating:

Caution Poison.

Eye and Skin Irritant.

Puma Super

Herbicide Group – 1
(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

92 g/L fenoxaprop-p-ethyl formulated as an emulsifiable concentrate. Container size – one case contains 2 x 8.1 L jugs.

Crops:

Spring wheat (including durum), and barley.*

*Apply to barley only when tank mixed with a broadleaf herbicide.

Weeds:

Wild oat, green foxtail, barnyard grass.

Crop Stage:

Apply to wheat that has a minimum of 1 leaf to a maximum of 6 leaves on the main stem plus 3 tillers. Apply to barley at 1 leaf to a maximum of 5 leaves on the main stem plus 2 tillers. Application beyond this stage may result in crop injury.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Apply when annual grass weeds are in the 1 to 6 leaf stage with a maximum of 3 tillers. Optimal staging is from 2 to 4 leaves.

Cost:

$7.90 to $15.82 per acre (1999 suggested retail price).

Rates:

For green foxtail control apply at 0.202 L/acre (one case treats 80 acres). For light populations of wild oat (in spring and durum wheat only), apply Puma Super alone at 0.35 L/acre (one case treats 46 acres). **APPLY PUMA SUPER TO BARLEY ONLY IN TANK MIX WITH A BROADLEAF TANK MIX PARTNER.** Severe injury to barley will result from application of Puma Super alone. For control of annual grass weeds and for wild oat control when tank mixing, apply at 0.405 L/acre (one case treats 40 acres).

Water volume:

Wheat: 5-10 gal/acre (23-45 L/acre).
Barley: 10 gal/acre (45 L/acre)

Pressure:

275 kPa (40 psi)

Nozzles:

80° or 110° flat fan nozzles tilted forward at a 45° angle. Do not use flood jet nozzles, controlled droplet application equipment or Sprafoil® equipment

How it Works:

Puma Super is a systemic herbicide that is translocated from the leaves to the growing points within the plant. Symptoms include reduced growth and chlorosis (yellowing) of treated leaves within 3 to 7 days. Chlorosis progresses and plant death occurs 14 to 21 days after application.

Effects of Growing Conditions:

Crop injury and/or reduced weed control may result if applications are made while the plant is under stress. Plants can be stressed by hot, and/or dry conditions, frost, waterlogged soil, and damage from severe weather, disease or insects. Using maximum rates and optimal staging can help to reduce the effects of weather if application under these conditions is unavoidable.

Tank Mixes:

Herbicides: The following products may be tank mixed with Puma Super used at the 0.405 L/acre rate (* may also be used with the 0.202 L/acre rate for green foxtail control):

Barley:
  MCPA Ester (500 g/L) – 0.34 L/acre
  Refine Extra – 8.1 g/acre*
  Refine Extra + MCPA Ester (500 g/L only) * - 8.1 g/acre + 0.34 L/acre

NOTE: DO NOT apply Puma Super alone in barley: always tank mix with a registered broadleaf partner.

Spring and Durum Wheat only:
  2,4-D Ester (600 g/L) – 0.283 L/acre*
  2,4-D ester (700 g/L) - 0.243 L/acre*
  Ally – 0.002 to 0.003 kg (2 to 3 g)/acre*
  Assert - 0.54 L/acre. Use 0.15 L/acre Puma Super in this tank mix.

Buctril M – 0.405 L/acre*
Curtail M – 0.80 L/acre
Estaprop – 0.708 L/acre*
Lontrel 360 – 0.17 L/acre*
Lontrel 360 + MCPA Ester (500 g/L only) - 0.17 L/acre + 0.34 L/acre
Lontrel 360 + MCPA Ester (500 g/L only) - 0.11 L/acre + 0.34 to 0.45 L/acre
MCPA Amine (500 g/L) – 0.34 L/acre*
MCPA Ester (500 g/L) – 0.34 L/acre*
Refine Extra – 8.1 g/acre*
Refine Extra + MCPA Ester (500 g/L only) - 8.1 g/acre + 0.34 L/acre*
Thumper – 0.405 L/acre*

Spring Wheat (not including durum) only:
Attain – "A" (0.24 L/acre) and "B" (0.40 L/acre)*
DyVel DS – 0.445 L/acre (only with 0.202 L/acre rate of Puma Super)
Unity – Unity 75WG (4.3 g/acre) and Unity 280EC (0.2 L/acre)

Fertilizers: None registered.

Insecticides: None registered.

Note: Leave an interval of 7 days prior to application or 4 days after application of Puma Super, when applying any pesticide that is not registered as a tank mix.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour may reduce control.

Grazing: Do not graze or cut for hay, crops that have been treated with Puma Super.

Recropping: No restrictions in the year after application. Only one application may be made per year.

Aerial Application: Do not apply by air.

Storage: Do not freeze.

Environment: Do not apply within 15 m of a body of water or wetland area.

Tank Cleaning:

Before and after using Puma Super, complete a thorough cleaning of the spray tank, lines, and filters. This is especially important, since the previously sprayed product may cause injury to the crop you intend to spray.

The manufacturer recommends flushing spray equipment with water/ammonia mixture to remove Puma Super after application.

Do not clean equipment where cleaning solution could flow towards water bodies, ditches, cropland, shelterbelts, or areas where people are likely to frequent.

Hazard Rating:

Caution Poison
Eye and Skin Irritant.

Pursuit

Herbicide Group – 2
(Refer to page 16)

Company:

Cyanamid Crop Protection

Formulation:

240 g/L imazethapyr formulated as a liquid. Container size - 3.3 L.

Crops:

Field peas, dry beans (pinto, pink and red varieties only), seedling alfalfa, established alfalfa (for seed production only), Smart canola varieties*, and chickling vetch grown for seed. Apply only to alfalfa stands that will be in production for 3 years following application.

*Application to **any** other variety of canola will result in crop death.

Do **NOT** use in the brown or dark brown soil zones (except for use in alfalfa under irrigated brown soils); rotational crops may be severely injured due to carryover in these soils. Do **NOT** apply Pursuit to the same field two years in a row.

Weeds:

In field peas and Smart canola varieties, weeds controlled include:

Green foxtail
Wild oats
Chickweed
Redroot pigweed
Stinkweed
Volunteer canola
  (not Smart varieties)
Lamb's-quarters
  (suppression)
Cleavers
Hemp nettle[1]
Shepherd's purse[1]
Smartweed
Wild buckwheat
Wild mustard
Volunteer wheat[2]
  (suppression)
Volunteer barley[2] (suppression)

[1] In field peas only.
[2] In Smart canola only.

In seedling and established alfalfa, weeds controlled include:

Redroot pigweed
Stinkweed
Wild mustard
Common groundsel[3]
  (suppression)
Volunteer canola
  (not Smart varieties)
Green smartweed[3]
Lamb's quarters[3] (suppression)
Green foxtail (suppression)
Shepherd's purse[3] (suppression)

[3] In seedling alfalfa only.

In dry beans, weeds controlled include:

Hairy nightshade

Crop Stage:

Field peas - may be applied up to the sixth above-ground node stage (6 true leaves).

Seedling alfalfa - apply after the first trifoliate leaf stage.

Established alfalfa - apply before alfalfa reaches 12 inches (30 cm) in height.

Smart canola - apply after the first leaf stage.

Dry beans - up to the second trifoliate leaf stage.

Chickling vetch grown for seed - apply at the 5 - 7 leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

Up to the 4 leaf stage. For wild oats, apply from the 2 to 4 leaf stage. Up to 6 leaf stage of hairy nightshade.

Cost:

$21.62/acre (1999 suggested retail price).

Rates:

Apply 0.085 L/acre. A non-ionic surfactant (Agral 90, Agsurf, Surf 92) should be added at a rate of 0.25 L per 100 L of spray solution. Do not overapply Pursuit, as crop injury may result. Only one application may be made during the growing season.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

10 to 40 gallons/acre (45 to 180 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Pursuit is a systemic herbicide that is absorbed through foliage and plant roots and is translocated to growing points in plants. Symptoms appear in 3 to 10 days and include yellow striping on the newest leaves of grassy weeds, and yellowish, purplish, or reddish discolouration of the newest leaves of broadleaf weeds. Symptoms progress to older leaves and plant death occurs in 1 to 3 weeks.

Effects of Growing Conditions:

Plants are under stress when conditions before or after application are very hot or cold, excessively dry or wet. During periods of stress, plants are not actively growing and reduced weed control or crop injury may result.

Tank Mixes:

Herbicides: In Field Peas;

- Pursuit at 0.04* to 0.085 L/acre (40 to 85 mL/acre) can be tank mixed with Poast Ultra at 0.19 L/acre.
- Pursuit at 0.085 L/acre (85 mL/acre) can be tank mixed with Select at 0.08 L/acre (80 mL/acre).

In SMART canola, Pursuit at 0.04* to 0.085 L/acre (40 to 85 mL/acre) can be tank mixed with;

- Poast Ultra at 0.19 L/acre
- Select at 0.08 L/acre.

* The use of Pursuit at low rates is not supported by Cyanamid. Check the label of the grass herbicide for the list of weeds controlled when using the low rate.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze or harvest seedling alfalfa within 14 days of treatment. Do not graze other treated crops or cut for feed prior to crop maturity. Do not graze or harvest field peas for feed within 30 days.

Preharvest: Do not apply within 60 days of harvesting field peas, within 70 days of harvesting Smart canola, or within 75 days of harvesting dry beans.

Recropping: Rotate to barley, spring wheat (not durum), lentils, alfalfa, field peas or Smart canola the year following application. The company recommends that a field bioassay (a test strip grown to maturity) be conducted the year **before** growing **any** crop other than those listed above. However, yield losses within the test strips may not be noticed unless the yield can be compared to an untreated area seeded adjacent to the Pursuit-treated strip. In case of crop failure, only field peas or Smart canola may be re-planted in the year of application.

Aerial application: Do not apply by air.

Storage: Do not freeze. If the product is exposed to temperatures below 0°C, thaw the product completely and shake the container vigorously prior to use.

Environment: Do not apply within 15 m of shelterbelts, waterbodies, wetlands, and woodlots.

Tank Cleaning:

Non-labelled grass and broadleaf crops can be damaged by in-tank residues. The manufacturer does not provide enough information on tank cleaning to make recommendations.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Keep out of reach of children.

Refine Extra Toss-N-Go

Herbicide Group – 2
(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

50 percent thifensulfuron methyl plus 25 percent tribenuron methyl formulated as a dry flowable. Container size - 4 water soluble bags (80 g each, total 320 g).

Crops:

Spring wheat (including durum), winter wheat, barley, oats. The following seedling or established grasses for forage and seed production: meadow bromegrass, smooth bromegrass, creeping red fescue, tall fescue, pubescent wheatgrass, tall wheatgrass, slender wheatgrass, streambank wheatgrass, crested wheatgrass, intermediate wheatgrass, northern wheatgrass, western wheatgrass, orchard grass, Kentucky bluegrass*

*established plants only.

Weeds Controlled and Staging:

Weeds Controlled:

Ball mustard
Chickweed (1 to 6 leaf)
Common groundsel
Corn spurry
Cow cockle
Flixweed
Green smartweed
Hemp-nettle
Kochia
Lady's-thumb
Lamb's-quarters
Narrow-leaf hawk's-beard
Redroot pigweed
Russian thistle
Shepherd's-purse
Stinkweed
Tartary buckwheat
Volunteer canola[1]
Volunteer sunflowers
Wild buckwheat (1 to 3 leaf)
Wild mustard

[1]Not including SMART canola varieties.

Weeds Suppressed:

Canada thistle (less than 6 inches (15 cm) tall or across and prior to budding)
Cleavers (1 to 3 whorls)
Round-leaf mallow (2 to 6 leaf)
Scentless chamomile
Sow-thistle (less than 6 inches (15 cm) tall or across and prior to budding)
Stork's-bill (2 to 6 leaves)
Toadflax (less than 6 inches or 15 cm tall)

Unless otherwise specified, weeds should be less than 4 inches (10 cm) tall or across.

Crop Stage:

2 leaf to flag leaf.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

$5.49/acre (1999 suggested retail price).

Rate:

0.008 kg or 8 g/acre (one container treats 40 acres). Add Agral 90, Agsurf, or Citowett Plus at 0.2 L per 100 L of spray solution.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 - 10 gallons/acre (22 - 45 L/acre).

Pressure:

210 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan nozzles with 50 mesh line strainers and screens.

How it Works:

Refine Extra is a systemic herbicide that is absorbed through foliage and translocated to growing points within plants. Symptoms include discolouration (yellowing, purpling, reddening) of newest leaves and are visible in 1 to 3 weeks.

Effects of Growing Conditions:

Do not apply to wheat, barley or oats that are stressed by severe weather conditions (frost, drought or water saturated soil) as crop injury may result.

Under certain conditions (heavy rainfall, prolonged cool weather, frost conditions, wide fluctuations in day/night temperatures) lightening in crop colour and reduction in crop height may occur.

Tank Mixes:

Do not mix with substances that contain boron or that release chlorine.

Herbicides: Refine Extra may be mixed with the following herbicides. Do not add a surfactant to the following mixes unless otherwise specified.

In spring wheat (including durum), barley, and oats:
MCPA amine or ester (0.28 to 0.45 L/acre, 500 g/L formulation) plus surfactant

In spring wheat (including durum) and barley,:
2,4-D amine or ester (0.34 to 0.45 L/acre, 500 g/L formulation) plus surfactant
Assert (0.53 to 0.65 L/acre)
Assert (0.53 to 0.65 L/acre) + MCPA ester (0.28 to 0.45 L/acre of a 500 g/L formulation)
Puma Super (0.202 to 0.405 L/acre)
Puma Super (0.202 to 0.405 L/acre) + MCPA ester (0.34 L/acre)

In spring wheat (NOT including durum) and barley,:
Curtail M (0.61 L/acre) plus surfactant
Lontrel 360 (0.085 L/acre) plus surfactant
Lontrel 360 (0.085 L/acre) + 2,4-D or MCPA ester (0.34 L/acre, 500 g/L formulation) plus surfactant

In spring wheat (including durum):
Accord (55 to 67 g/acre) plus Merge adjuvant
Accord (55 to 67 g/acre) + Avenge (1.42 L/acre) plus Merge adjuvant
Horizon (0.095 to 0.117L/acre) plus Score adjuvant
Horizon (0.095 to 0.117L/acre) + MCPA 500 ester (0.34 to 0.45 L/acre) plus Score adjuvant

In spring wheat (NOT including durum),:
Lontrel 360 (0.085 L/acre) + Puma (0.405 L/acre)

Check the above tank mix partner(s) respective labels for additional staging and varietal restrictions.

Fertilizers: None registered. Do not mix soluble bags with liquid fertilizers.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 4 hours may reduce control.

Grazing: Must not be grazed or fed to livestock for 7 days after treatment.

Recropping: None the year after treatment. Canola, flax, lentils and alfalfa may be planted 2 months after an application of Refine Extra.

Aerial Application: Do not apply by air.

Storage: Store in a cool, dry place. May be frozen.

Tank Cleaning:

Refine Extra can cause severe injury to sensitive crops at very low concentrations. Sprayers used to spray Refine Extra should be flushed out immediately after Refine Extra is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia rinse (1L of 3 percent ammonia per 100 L of water). All nozzles, screens and filters should be removed and cleaned after applying this product.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning - Eye and Skin Irritant

Reglone/Reglone Pro

Herbicide Group – 22
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

Reglone - 200 g/L diquat formulated as a solution with no adjuvant. Container size - 10 L.

Reglone Pro - 200 g/L diquat formulated as a solution with adjuvant in the formulation. Container size - 10.

Crops:

Dry beans, soybeans, peas, flax, solin (low linolenic acid flax), lentils, tame mustard, sunflowers, potatoes, alfalfa (for seed), bird's-foot trefoil (for seed), red and white clover (for seed) and canola (use on Argentine varieties only if crop is severely lodged). This product can cause pod drop and seed losses because of shattering in Argentine varieties of canola. Do not use on forage legumes that have been treated with a residual herbicide in the past 12 months.

Weeds:

Chemically dries down all green vegetation (including crop) present at the time of harvest.

Weed Stage:

Reglone will burn off green tissue on weed growth, regardless of stage.

Costs:

$10.77 to $30.52/acre (1999 suggested retail price).

Water Volumes:

Ground applications (Reglone, Reglone Pro) - 20 to 50 gallons/acre (90 to 225 L/acre). Use 50 to 100 gallons/acre (225 to 455 L/acre) on potatoes.

Ground applications (Reglone Pro only) - 13 to 20 gallons/acre (60 to 90 L/acre).

Aerial applications (Reglone and Reglone Pro) - minimum of 4 gallons/acre (18 L/acre).

Use the highest water volumes when crop canopy is heavy or if weed growth is dense.

Pressure:

Ground application - 200 to 275 kPa (30 to 40 psi).

How it Works:

Reglone is mainly a contact herbicide that is absorbed by the foliage of treated plants. Wilting and plant desiccation begins within several hours of application with plant death occurring in 1 to 3 days.

Effects of Growing Conditions:

Best results under cloudy conditions or in evening.

Shattering losses can increase if heavy winds, rain or hail occur after the crop has dried down.

Restrictions:

Rainfall: Within 15 minutes may reduce effectiveness.

Grazing: Crop residues remaining after harvest may be fed to livestock.

Aerial Application: May be applied by air in a minimum of 4 gallons/acre (18 L/acre) water volume.

Recropping: No restrictions the year after application.

Storage: Do not freeze.

Environment: Do not apply by air where wetlands or other good wildlife cover are present. Leave a 15 m border around the edges of sloughs and other wildlife cover.

Crop Stage:

CROP	STAGE
Dry beans, soybeans	Crop has lost 80 to 90 percent of leaves and 80 percent of pods are yellow
Flax, solin (linola)	75 percent of bolls brown
Lentils	Lowest pods are light brown and rattle when shaken
Mustard	75 percent of seed has turned brown
Canola	60 to 75 percent of seed has turned brown
Sunflowers	Backs of sunflower heads and bracts are turning yellow and seed moisture is 20 to 50 percent

CROP	STAGE
Potatoes	Two weeks prior to harvest
Alfalfa (for seed), bird's-foot trefoil (for seed), red and white clover (for seed)	Pods are ripe but before shattering. Harvest within 7 days.
Peas	Bottom pods are ripe and dry with seeds detached from pods.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Fungicides: Fungicides may be added when applying Reglone to potatoes for vine killing.

Tank Cleaning:

When finished spraying Reglone, rinse the sprayer out with clean water. Run through pump, lines and nozzles. Drain tank by spraying out on an untreated portion of a crop on which the product is registered, or by spraying on uncropped land. Refill sprayer with water and Agral 90, Agsurf at 0.6 L per 1,000 L spray solution. Run the solution through lines and boom. Spray out, then refill with clean water. Leave equipment standing overnight, then drain water out.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members are likely to frequent or walk.

Hazard Rating:

Warning Poison
Danger Eye Irritant
Warning Skin Irritant

Rates:

Add 0.1 L of Agral 90 or Agsurf per 100 L of spray solution for all Reglone applications except those noted below. Reglone Pro does not require the addition of an adjuvant.

CROP	RATE (L/ACRE)	
	Ground Applied	Aerial Applied
Dry beans, soybeans, canola, flax, solin (linola), lentils, mustard, peas, sunflowers (average crop, few weeds)	0.6	0.8
Dry beans, soybeans, canola, flax, solin (linola), lentils, mustard, peas, sunflowers (dense crop, heavy weed infestations)	0.8	1.1
Potatoes - (light stands, few weeds)	0.8 to 1.1*	2 applications are required First application - 0.8 to 1.1 L/acre (use the high rate for dense or immature vines) Second Application (4 to 5 days later) - 0.6 L/acre
Potatoes - (dense crop, heavy weedinfestations)	1.7*	
Alfalfa, bird's-foot trefoil, red and white clover	0.8 to 1.3	not registered

*Adjuvant not required for ground applications in potatoes at these application rates. Refer to the label for more information.

Reglone A

Herbicide Group – 22
(Refer to page 16)

Company:

Zeneca Agro

Formulation:

200 g/L diquat formulated as a solution.
Container sizes - 1 L and 5 L jugs.

Use:

Control of water weeds such as coontail, duckweed, Canada water weed, pond weeds, and water milfoil in farm dugouts. Offers temporary control of certain species of algae.

Cost:

$29.00/L (1999 suggested retail price).

Application Timing:

Mid-May through late June.

Rates:

Dugouts less than 5 feet (1.5 m): Apply 8.9 L/acre. At this rate, 2.6 L of Reglone A will treat a dugout that is 160 feet by 80 feet (49 m x 24.4 m).

Dugouts more than 5 feet (1.5 m): Apply 12.1 to 14.2 L/acre. At these rates, a dugout that is 160 feet by 80 feet (49 m x 24.4 m) will require 3.6 to 4.2 L of Reglone A.

Equipment:

Dilute 1 part Reglone A with 4 parts clean water. Spray over the water surface.

How it Works:

Reglone is mainly a contact herbicide that is absorbed by the foliage of treated plants. Wilting and plant desiccation begins within several hours of application with plant death occurring in 1 to 3 days.

Restrictions:

Environment: If weed growth is dense, protect fish by not treating more than one-fourth of dugout at a time.

Grazing: Do not use water for animal consumption for 24 hours after application.

Irrigation: Do not use water for irrigation for 5 days after application.

Domestic Use: Do not use water for human consumption for 24 hours after application.

Storage: Do not freeze.

Equipment Clean Out:

Use a detergent or wetting agent (Agral 90, Agsurf) at 60 mL per 100 L of water to flush equipment. Then rinse with clean water, leave clean water standing overnight.

Hazard Rating:

Warning Poison
Danger Eye Irritant
Warning Skin Irritant

Roundup FastForward

Herbicide Group – 9, 10
(Refer to page 16)

Company:

Monsanto Canada Inc.

Formulation:

300 g/L glyphosate acid equivalent, present as the isopropylamine salt.
16 g/L glufosinate ammonium.

Container size - 10L, 115L, 750L.

Crops:

Wheat, canola, flax (not including low linolenic acid varieties), peas, lentils, dry beans. Do not apply to crops grown for seed production.

Weeds:

Quackgrass, Canada thistle, general crop and weed drydown.

Crop Stage:

Apply 1.2 L/acre when crop seed moisture is 30 per cent or less. This stage typically occurs 7 to 14 days before harvest (refer to the table for visual indicators).

Timing Guidelines for Application:

CROP(S)	VISUAL SYMPTOMS INDICATING LESS THAN 30% GRAIN MOISTURE
Wheat	Hard dough stage; a thumbnail impression remains on seed.
Canola	Pods are green to yellow; most seeds are yellow to brown.
Flax (not including low linolenic acid varieties)	Majority (75% - 80%) of bolls are brown.
Peas	Majority (75% - 80%) of pods are brown.
Lentils	Lowermost pods (bottom 15%) are brown and seeds rattle.
Dry Beans	Stems are green to brown in color; pods are mature (yellow to brown in color); 80 - 90% leaf drop (original leaves).

Weed Stage:

For best results quackgrass should be actively growing and have at least 4 to 5 green leaves. Canada thistle should be actively growing and at or beyond the bud stage.

Cost:

$13.19/L (1999 suggested retail price).

Rates:

1.2 L/acre.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan.

How it Works:

Roundup Fast Forward contains a non-selective, systemic herbicide which moves from treated foliage into roots, killing the entire plant. It also contains a contact herbicide that is absorbed through foliage which causes yellowing and wilting 2 to 5 days after application which advance to complete browning of the above ground growth and deterioration of underground plant parts.

Effects of Growing Conditions:

Extremely cool, wet and/or cloudy weather at treatment time may slow product activity, delaying visible symptoms and crop drydown and harvest date. Do not treat plants affected by drought or disease or insect damage. Reduced results may also occur when treating weeds heavily covered with dust.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Do not apply if rainfall is forecast for the time of application as results may be reduced.

Grazing: No restrictions.

Recropping: No restrictions.

Aerial application: Do not apply by air.

Storage: May be frozen.

Environment: Do not apply within 15m of non-target areas including water bodies, wetlands (e.g. sloughs), shelterbelts, woodlots and other cover at field edges frequented by wildlife.

Equipment: Do not mix, store or apply this product in galvanized or unlined steel (except stainless steel) containers or spray tanks.

Tank Cleaning:

Flush equipment with water immediately after use.

Do not clean equipment upslope of water bodies, ditches, cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent.

Hazard Rating:

Caution Skin and Eye Irritant.

Roundup Transorb/Roundup Original/ Roundup Dry/Roundup Renew

See Glyphosate sections on pages 115-125

Rustler

Herbicide Group – 4, 9
(Refer to page 16)

Company:

Monsanto Canada Inc.

Formulation:

132 g/L glyphosate present as the isopropylamine salt.

60 g/L dicamba present as a solution.

Container sizes - 10 L, 115 L.

Crops:

Summerfallow.

Preseeding in spring on fields to be sown to wheat, barley, oats and rye. May also be applied prior to sowing field corn in fields with more than 2.5 percent organic matter (do not use on sandy or sandy loam soils). Broadleaf crops such as lentils, peas, canola and flax will be injured by preseeding applications and should not be planted in fields receiving this treatment.

Weeds:

Downy brome
Volunteer cereals
Persian darnel
Green foxtail
Wild oats
Wild buckwheat
Volunteer canola
Cow cockle
Flixweed
Kochia
Lady's-thumb
Lamb's-quarters
Wild mustard
Redroot pigweed
Smartweed
Stinkweed
Russian thistle
Foxtail barley (suppression only)

Crop Stage:

Apply during fallow year or prior to sowing crops noted above.

Rates and Weed Stages:

Application should be made to emerged, actively growing weeds. Application at early growth stages generally provides the best results.

Annual grasses - Apply 1 L/acre anytime between emergence and heading. For wild oat control apply at the 1 to 3 leaf stage.

Annual broadleaves - Apply 1 L/acre anytime up to 6 inches (15 cm) height. For wild buckwheat control, apply at the 1 to 4 leaf stage.

Foxtail barley - Apply 1.26 L/acre for suppression of foxtail barley before initiation of the seed head.

Cost:

$5.99 to $7.55/acre (1999 suggested retail price).

Water Volume:

Apply 5 to 10 gallons/acre (25 to 45 L/acre) water. Use of the lower water volume will improve control. Avoid the use of extremely hard water (greater than 700 ppm calcium or magnesium or high levels of iron).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

How it Works:

Rustler is a systemic herbicide which enters the plant through treated foliage. The herbicide moves to all growing points in shoots and roots, killing the plant. Visible symptoms appear in 5-7 days. Affected plants turn yellow, wilt and eventually turn brown. Complete control can take as long as 21 days.

Effects of Growing Conditions:

Reduced results may occur if application is made to weeds that are drought-stressed, damaged by disease or insects. Poor control under cool, cloudy weather can occur. Dust on foliage can also cause reduction in control.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Within 6 hours may reduce weed control. Heavy rainfall within 2 hours of application may require a repeat treatment.

Grazing: Do not graze treated areas or cut for feed.

Recropping: None.

Aerial Application: Do not apply by air.

Storage: Store above 5°C.

Equipment: Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks.

Tank Cleaning:

Clean sprayer thoroughly after application.

Flush tank with clean water and thoroughly rinse entire sprayer system. Fill tank with water and ammonia, using 1 L of household ammonia (3 percent) per 100 L of water. Pump enough solution through system to fill all parts. Fill tank, close and leave for 24 hours before draining and rinsing thoroughly with water.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

May cause irreversible eye damage.

Select

Herbicide Group – 1

(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

240 g/L of clethodim formulated as an emulsifiable concentrate.

Container size - 3 L.

Crops:

Canola, flax (including low linolenic acid varieties), potatoes, soybeans, field peas, lentils, chickpeas, mustard (oriental, brown, yellow), sunflowers and seedling alfalfa.

Weeds:

Wild oat
Green foxtail
Yellow foxtail
Barnyard grass
Proso millet
Persian darnel
Volunteer wheat
Volunteer barley
Volunteer oat
Volunteer corn
Volunteer canary seed
Quackgrass

Crop Stage:

Crops are tolerant at all growth stages. Apply to chickpeas before crop reaches the 9 node stage (7 inches or 18 cm maximum height).

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 6 leaf stage of annual grasses and volunteer cereals. Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are controlled before tillering. Apply to quackgrass at the 2 to 6 leaf stage, or when quackgrass is 3 to 6 inches (6 to 15 cm) tall. Best control at the 3 to 5 leaf stage.

Cost:

$11.65 to $34.95/acre (1999 suggested retail price).

Rates and Weed Staging:

WEED	STAGE	RATE (L/ACRE)	AMIGO ADJUVANT (L PER 100 L SPRAY SOLUTION)	ACRES TREATED PER 3 L CONTAINER
Annual grasses (light[1] infestations only)	2 to 4 leaf	0.05[2]	0.5	60
Annual grasses Quackgrass (suppression only)	2 to 6 leaf	0.08	0.5	40
Quackgrass (season long control)	2 to 6 leaf	0.15	1.0	20

[1] The company does not provide guidelines for weed densities under light infestations. When in doubt as to the level of weed infestation, use the higher rate or contact your local Rhone Poulenc technical representative.

[2] At this rate, Select should not be tank mixed with any other pesticide and should only be applied under the following growing conditions: good crop stand, within the recommended leaf staging (2 to 3 leaf is optimum timing) prior to tillering, light weed infestations, adequate moisture and fertility, absence of stress, and good growing conditions.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (25 to 45 L/acre). Use 10 gallons/acre (45 L/acre) under dense weed infestations or dense crop canopies.

Pressure:

275 kPa (40 psi).

Nozzles:

Stainless steel 80° flat fan nozzles tilted forward at a 45° angle.

How it Works:

Select is a systemic herbicide that is translocated from treated foliage to growing points of leaves, roots and stems. Affected plants turn color from green to yellow to purple and finally brown. Control takes 7 to 21 days.

Effects of Growing Conditions:

Select will be less effective when plants are stressed by lack of moisture, excessive moisture, low temperature and/or very low relative humidity. Regrowth of tillers may occur if application is made under any of the above stress conditions.

Tank Mixes:

Herbicides:

Flax (not including low linolenic acid varieties) - Select may be tank mixed at 0.08 to 0.15 L/acre with Buctril M or MCPA ester.

Select may be tank mixed at 0.08 L/acre with Lontrel at 0.23 to 0.34 L/acre. Add the recommended amount of Amigo with all tank mixes.

Flax (low linolenic acid varieties) - Select may be tank mixed at 0.08 L/acre with Buctril M.

Canola - Select may be tank mixed at 0.08 L/acre with: Lontrel at 0.17 to 0.34 L/acre.
Muster at 0.008 to 0.012 kg/acre (redroot pigweed is controlled at the 0.008 kg/acre rate of Muster in this tank mix).
Select at 0.0255 L (25.5 mL) may be tank mixed with Liberty at 1.1 to 1.35 L/acre for use in Liberty Link varieties ONLY for enhanced control of wild oat and volunteer cereals.
Select at 0.08 L/acre may be tank mixed with Pursuit at 0.04 -0.085 L/acre.
At the low rate of Pursuit, the following weeds are controlled: chickweed, hemp-nettle, redroot pigweed* stinkweed, volunteer canola (NOT SMART varieties) wild buckwheat*, wild mustard, plus weeds listed on Select label.
*Light infestations only. For heavy infestations, use high rate of Pursuit. Add the recommended amount of Amigo with all tank mixes.

Field peas - Select may be tank mixed at 0.08 L/acre with 0.085 L/acre Pursuit. Add the recommended amount of Amigo.

Allow 4 days between application of Select and any other chemical not recommended as a tank mix combination on the label.

Fertilizer: None registered.

Insecticide: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 1 hour may reduce control.

Grazing: Do not graze or cut treated crops for forage until

60 days after application of Select to annual crops, and 30 days after application to seedling alfalfa.

Preharvest: Do not apply within 60 days of harvesting canola, flax, solin (Linola), lentils, potatoes, chickpeas (Desi and Kabuli) or mustard (brown, yellow, oriental). Do not apply within 75 days of harvesting soybeans or field peas. Do not apply within 30 days of harvesting seedling alfalfa. Do not apply within 72 days of harvesting sunflowers.

Aerial Application: Do not apply by air.

Storage: May be stored at any temperature.

Other: Do not apply more than 0.15 L/acre to the same land area per season.

Tank Cleaning:

When finished spraying Select, thoroughly clean the sprayer by flushing the system with clean water containing detergent.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Skin and Eye Irritant

Sencor

Herbicide Group – 5
(Refer to page 16)

Company:

Bayer Inc. (Sencor)

Formulations:

Sencor Solupak 75 DF - 75 percent metribuzin formulated as a dispersable granule. Container size - 2.5 kg (5 water soluble bags, 500 g each).

Sencor 500F - 50 percent metribuzin formulated as a flowable. Container size - 5 L.

Sencor 75 DF - 75 percent metribuzin formulated as a dispersible granule. Container size - 2.5 and 5 kg.

Crops:

Barley, spring wheat (including durum), winter wheat (Norstar only), fababeans, lentils, peas, chickpeas, soybeans (KG20 and McCall only), potatoes (except varieties Belleisle, Shepody and Tobique and red-skinned or early maturing varieties).

DO NOT use on lentils, peas or chickpeas seeded less than 2 inches (5 cm) deep or in soils with less than 4 percent organic matter.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weeds Controlled:

Spring wheat (including durum) and barley.
Chickweed, common groundsel[1], corn spurry[1], green smartweed, hemp-nettle[1], henbit[1], lady's-thumb, lamb's quarters, night flowering catchfly[1], redroot pigweed, Russian thistle, stinkweed, tartary buckwheat, volunteer canola (non-TTC), ball mustard[1], wild mustard, wormseed mustard[1].

Winter Wheat
Downy brome, flixweed, shepherd's-purse, stinkweed.

Field peas, lentils[2] and chickpeas[2]
Chickweed, corn spurry, green smartweed, hemp-nettle, lamb's quarters, stinkweed, tartary buckwheat, volunteer canola (non-TTC), ball mustard, wild mustard.

Potatoes:
As for field peas plus lady's-thumb, shepherd's-purse, redroot pigweed.

Fababeans (must be applied PPI with either Edge or Treflan EC).
Chickweed, corn spurry, green smartweed, hemp-nettle, lamb's quarters, stinkweed, tartary buckwheat, volunteer canola, wild mustard, ball mustard plus weeds controlled by either Edge or Treflan EC.

Soybeans (must be applied PPI with Treflan EC).
Chickweed, corn spurry, green smartweed, hemp-nettle, lamb's quarters, stinkweed, tartary buckwheat, volunteer canola, wild mustard, ball mustard plus weeds controlled by Treflan EC.

[1] Use the high rate for best control.

[2] Suppressed only in lentils and chickpeas.

Weed Stage:

Pre-emergence.

Postemergence applications should be made when weeds are small - 2 inches (5 cm) in height or diameter.

Split applications (postemergence on lentils and peas) - 1st application at cotyledon to 2 leaf stage of weeds. 2nd application (if necessary) 7 to 10 days after the first.

Cost:

Cereals, lentils, peas, chickpeas - $4.68 to $9.67/acre.

Potatoes - $9.37 to $14.19/acre (1999 suggested retail price).

Water Volume:

Preplant incorporated - 10 gallons/acre (45 L/acre).

Postemergence applications - Cereals - 10 gallons/acre (45 L/acre). Lentils, peas, chickpeas - 15 gallons/acre (70 L/acre).

Pressure:

200 - 275 kPa (30 to 40 psi).

Nozzles:

Flat fan nozzles with opening no smaller than 8002 or TK2 with 50 mesh screens. For lentils, peas and chickpeas use nozzles no smaller than 8003 or TK3. Angle nozzles 45° forward.

Incorporation: All plant growth and stubble should be thoroughly worked into the soil before treatment. Apply directly to the soil surface. Two incorporations are required at right angles for thorough mixing. The first incorporation must be made within 24 hours of spraying. For fall applications, it is preferred that both incorporations be done in the fall. The second incorporation may be delayed until spring to conserve trash; however, both incorporations must be done at the recommended depth.

Incorporate with a tandem disk, disker or field cultivator (Vibrashank type). Set equipment to work at a depth of 3 to 4 inches (8 to 10 cm). Operate disc implements at 4 to 6 mph (7 to 10 km/hr), cultivators at 6 to 8 mph (10 to 13 km/hr).

Crop Stage:

CROP	APPLICATION TIMING
Barley, spring wheat	2 to 5 leaf stage.
Winter wheat	In late fall after tillers have developed (past the 3 leaf stage).
Peas	Preplant incorporated (when tank mixed with Edge DC, Rival or Treflan EC) or postemergence - up to 6 inches (15 cm) of vine length. For short-statured, determinate flowering peas, apply at the early stages within this range.
Lentils	Up to 6 inches (15 cm) of vine length. For maximum crop tolerance, apply at the 1 to 4 above ground node stage.
Chickpeas	Up to 2.5 inches (6 cm) in height, when vines have 1 - 3 above ground nodes. Note application past recommended growth stage may result in severe crop injury.
Potatoes	Preplant incorporated (with Eptam) or early postemergence (up to 4 inches or 10 cm in height).
Soybeans	Preplant incorporated (tank mixed with Treflan EC).
Fababeans	Preplant incorporated (tank mixed with Treflan EC or Edge DC).

How it Works:

Sencor and Lexone are systemic herbicides which kill weeds by stopping photosynthesis. Control may not be noticeable for 7 to 10 days after treatment.

Effects of Growing Conditions

Crop height reductions or yellowing may occur if high temperatures occur within 48 hours of application. Cold, cloudy weather or frost within 3 days of application will also aggravate injury. If frost occurs, allow 4 to 5 days for crop to recover prior to applying Sencor. Heavy rainfall soon after application to peas, lentils and chickpeas can result in stand reduction on soils with less than 4 percent organic matter.

Tank Mixes:

Herbicides: In spring wheat or barley, may be tank mixed with Banvel II, Target, MCPA amine or 2,4-D amine. In potatoes (preplant incorporated) must be applied as a tank mix with Eptam 8-E. In fababeans, must be applied as a tank mix with Edge DC or Treflan EC. In soybeans, Sencor must be applied as a tank mix with Treflan EC. In peas, Sencor may be tank mixed with Treflan, Edge or Rival. In peas, 0.113 L/acre Sencor 500F or 0.077 kg/acre Sencor 75 DF may be tank mixed with 0.19 L/acre MCPA sodium salt (300 g/L).

Fertilizers: None registered.

Insecticides: None registered.

Allow 5 days between application of Sencor and application of other pesticides.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Rates:

CROP	APPLICATION	RATES (kg or L/acre)
Barley	Postemergence	Sencor 500F - 0.111 to 0.223 Sencor 75DF - 0.08 to 0.152
Wheat	Postemergence	Sencor 500F - 0.111 to 0.172 Sencor 75DF - 0.08 to 0.111
Winter wheat	In fall - postemergence	Sencor 500F - 0.344 to 0.45
Peas	Postemergence	Sencor 500F - 0.172 to 0.223 Sencor 75DF - 0.111 to 0.152
	Split applications[1] (Do not use on processing peas)	First application of: Sencor 500F - 0.08 to 0.11 Sencor 75DF - 0.06 to 0.08 Second application 7 to 10 days later with rates within these ranges.
	Preplant incorporated (apply tank mixed with Treflan EC, Rival or Edge DC) (Do not use on processing peas)	Sencor 500F - 0.223 to 0.283 (spring) Sencor 500F - 0.280 to 0.345 (fall) Sencor 75DF - 0.152 to 0.192 (spring) Sencor 75DF - 0.190 to 0.223 (fall)
Fababeans	Preplant incorporated (apply tank mixed with Treflan EC or Edge DC)	Sencor 500F - 0.172 to 0.343 (spring) Sencor 500F - 0.280 to 0.345 (fall) Sencor 75DF - 0.111 to 0.223 (spring) Sencor 75DF - 0.190 to 0.223 (fall)
Lentils	Postemergence	Sencor 500F - 0.172 Sencor 75DF - 0.111
	Split applications[1]	First application of: Sencor 500F - 0.08 to 0.11 Sencor 75DF - 0.06 to 0.08 Second application 7 to 10 days later with rates within these ranges.
Chickpeas	Postemergence	Sencor 500F - 0.167 Sencor 75 DF - 0.111
Potatoes	Postemergence	Sencor 500F - 0.222 Sencor 75DF - 0.151
	Preplant incorporated (apply only when tank mixed with Eptam 8-E)	Sencor 500F - 0.222 to 0.343 Sencor 75DF - 0.152 to 0.223
	Pre-emergence in sprinkler irrigation systems (apply only in a tank mix with Eptam 8-E)	Sencor 500F - 0.222 to 0.343 Sencor 75DF - 0.152 to 0.223
Soybeans	Preplant incorporated (apply only when tank mixed with Treflan EC)	Sencor 500F - 0.172 to 0.344 Sencor 75DF - 0.111 to 0.223

[1] Under certain field or weather conditions a split application may provide better weed control than a single application. The first application should be made at the cotyledon to 2 leaf stage of the weeds. The second application should be made when a second flush of weeds have emerged or if weeds which were more advanced at the time of the first application have started to show regrowth. The split applications are normally 7 to 10 days apart.

Note: When Sencor is tank mixed with Edge or Treflan in peas, fababeans, and soybeans, refer to product label for maximum rates that can be applied on light textured soils.

Restrictions:

Rainfall: Within 6 hours may reduce control.

Grazing: Do not graze treated cereal crops within 30 days of application, or peas and lentils within 70 days of application.

Preharvest: Do not harvest barley, wheat or potatoes within 60 days of application. Do not harvest lentils, chickpeas, or field peas within 70 days of application. Do not harvest processing peas within 40 days of application.

Recropping: Preplant incorporated treatments may leave a residue in the soil that will affect succeeding crops when using higher rates of product. Do not seed canola, sunflowers, onions, celery, peppers, cole crops, lettuce, spinach, red beets, turnips, pumpkin, squash, cucumbers or melons the year after treatment. Fall seeded crops may be injured when seeded the same year as preplant or postemergence applications of these products.

Aerial Application: No restrictions on label. Reduced weed control and increased crop injury can occur with aerial applications.

Storage: May be frozen.

Tank Cleaning:

Spray equipment must be thoroughly cleaned to remove traces of herbicide that might injure other crops to be sprayed. Drain any remaining spray solution from the spray tank. Rinse the spray tank and refill with water, adding a heavy-duty detergent at the rate of 0.25 L per 100 L of water. Recycle this mixture through the equipment for 5 minutes and spray out. Repeat this procedure twice. Fill the spray tank with clean water, recycle for 5 minutes, and spray out. Clean pump and nozzle screens thoroughly. Wash away any spray mixture from the outside of the spray tank, nozzles or spray rig.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Keep out of reach of children.

Stampede EDF + 2,4-D or MCPA or Refine Extra

Herbicide Group – 7, 4/2

(Refer to page 16)

Company:

Rohm and Haas Canada Inc.

Formulation:

Stampede EDF - 80 percent propanil formulated as an extruded dry flowable. Container size - 10 kg.

Crops:

Barley, flax, oats, spring wheat (including durum), canaryseed, Kentucky bluegrass for seed (green foxtail suppression when applied alone). See tank mix section for tank mixing/cropping restrictions.

Weeds:

Weeds controlled by Stampede + 2,4-D or MCPA or Refine Extra:

Annual sunflower[1]
Bluebur
Burdock[1]
Chickweed[2]
Cocklebur[1]
Flixweed
Goat's beard[1]
Green foxtail
Hemp-nettle[2]
Kochia[2]
Lady's-thumb
Lamb's quarters[2]
Narrow-leaf hawk's beard[1]
Plantain[1]
Prickly lettuce[1]
Redroot pigweed
Russian pigweed[1,2]
Russian thistle[1,2]
Shepherd's-purse
Smartweed[2]
Stinkweed[2]
Sweet clover[1]
Tartary buckwheat
Volunteer canola[2]
Wild buckwheat[2]
Wild mustard[2]
Wild radish[1]
Yellow foxtail

[1] Controlled with 2,4-D tank mix only.
[2] Controlled with Refine Extra tank mix only.

Crop Stage:

Cereals - 2 to 5 leaf stage. Best crop tolerance at the 3 to 4 leaf stage.

Canaryseed - 2 to 4 leaf stage.

Flax - 2 to 5 inches (5 to 12 cm) in height.

Temporary crop injury (yellowing and tip burning) may appear 2 to 5 days after application.

Weed Stage:

Green foxtail - 1 to 3 leaf stage and less than 1 inch (2.5 cm) in height.

Wild buckwheat - 1 to 3 leaf stage.

Kochia, Russian thistle - less than 1 inch (2.5 cm) in height or across.

Other broadleaf weeds - 1 to 4 leaf stage.

Cost:

Stampede EDF - $9.30/acre (not including cost of tank mix partner) (1999 suggested retail price).

Rates:

Apply 0.5 kg/acre (one 10 kg container treats 20 acres). For optimum green foxtail control, Stampede EDF must be tank mixed with a broadleaf product as listed in Tank Mix section.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

For standard ground sprayers, use a minimum of 10 gallons/acre (45 L/acre) water or reduced control may result. When using floater type equipment, apply in 15 gallons/acre (70 L/acre) water. Ensure that water temperature is at least 10°C. Do not apply with a spray coupe.

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan with 50 mesh or coarser nozzle and filter screens.

How it Works:

Stampede is a contact foliar herbicide. Affected weeds turn brown in 3 to 5 days. Because activity is contact, thorough coverage is essential. Do not apply under stressful conditions.

Effects of Growing Conditions:

This product can cause crop injury (severe burning, yellowing) under certain environmental conditions.

Do not spray when temperatures are below 15°C or when daytime high temperatures will exceed 30°C as severe crop injury will occur. Do not apply if crop is recovering from frost damage or if frost is expected within 24 hours. Crops damaged by winds should be fully recovered before applying Stampede. Best weed control is obtained when relative humidity is high and daily maximum temperatures range from 21 to 25°C. Poor control can be expected if top soil is dry to a depth of 2 inches (5 cm) or more.

Tank Mixes:

Herbicides:
Wheat (not including durum) - Stampede EDF **MUST** be tank mixed with:
0.32 L/acre MCPA amine or ester or 2,4-D amine (500 g/L) **OR** 0.27 - 0.40 L/acre 2,4-D ester LV 600 **OR** Refine Extra* (0.008 kg/acre).

Durum wheat - Stampede EDF must be tank mixed with 0.23 L/acre MCPA ester 500 **OR** 0.32 L/acre 2,4-D amine 500 **OR** 0.27 to 0.40 L/acre 2,4-D ester LV 600 **OR** Refine Extra* (0.008 kg/acre).

Barley, oats - Stampede EDF **MUST** be tank mixed with 0.23 L/acre MCPA ester 500 **OR** Refine Extra* 0.008 kg/acre.

Flax, canaryseed - Stampede EDF **MUST** be tank mixed with 0.23 L/acre MCPA ester 500.

*Add a recommended surfactant such as Agral 90, Agsurf or Citowett Plus.

Allow a 3 day interval before or after application of Stampede EDF and other herbicides.

Do not apply Stampede after a field has been treated with a triazine herbicide (for example, Lexone/Sencor, Bladex, Simazine or Princep) unless all of the triazine residues have disappeared.

Fertilizers: None registered.

Insecticides: Decis may be applied as a tank mix with Stampede EDF. Allow 14 days between application of Stampede and dimethoate (Cygon) or malathion insecticides. Allow 5 days after applications of Stampede on wheat and 10 days on barley, prior to applying Furadan. Do not spray other insecticides the same season as Stampede. Severe crop injury can result if carbaryl (Sevin) or parathion methyl or Guthion are applied in the same crop year with Stampede.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 4 hours will reduce control.

Grazing: Do not graze treated crops or cut for hay prior to crop maturity.

Recropping: No restrictions the season after Stampede application.

Aerial Application: Do not apply by air.

Storage: Stampede EDF may be frozen.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops can be severely injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison

Sundance

Herbicide Group – 2
(Refer to page 16)

(For use in the Dark Brown, Black and Grey Wooded soils of Manitoba and Saskatchewan with greater than 4% organic matter)

Company:

Monsanto Canada Inc.

Formulation:

75 percent sulfosulfuron formulated as a water dispersible granule. 432g per case.

Adjuvant: Merge – 8 L.

Crop:

Spring wheat (including Kyle and Plenty durum)

(Do not underseed forage legumes).

Weeds Controlled:

Grass: Foxtail barley, green foxtail[1], quack grass[1], wild oat.

Broadleaf: cleavers, common chickweed, dandelion[2], perennial sow-thistle[2], redroot pigweed, stinkweed, volunteer canola (NOT including SMART canola), wild mustard.

[1] Suppression only

[2] Spring seedlings are controlled and established plants are suppressed.

Crop Stage:

Prior to emergence of the 4th tiller.

Weed Stage:

Wild oat: From emergence to the 6 leaf stage with no more than 3 tillers. For optimum weed control and crop yield, apply prior to tillering.

Annual broadleaf weeds: Apply to the seedling stage for optimum weed control.

Perennial weeds: Prior to flowering when plants are actively growing.

Cost:

$16.99 / acre (1999 suggested retail price including adjuvant).

Rates:

0.011 kg (11g)/acre or 40 acres/case
Plus: Merge at 0.2 L/acre.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L / acre)

Pressure:

275 kPa (40 psi)

Nozzles:

Flat fan. Choose nozzles that provide optimum spray distribution and coverage at the appropriate spray pressure. Do not use flood jet or controlled droplet application equipment.

How it Works:

Sundance is a systemic herbicide that is absorbed by both leaves and roots and moves rapidly to the growing points of the plant. Growth of susceptible weeds stops soon after application. Symptoms include discoloration (yellowing, reddening, purpling) of new leaves and are visible 1-3 weeks after application, depending on growing conditions and susceptibility of target plants.

Effects of Growing Conditions:

For optimum results, do not apply to weeds growing under stress.

Tank Mixes:

Herbicides:

- 2,4-D ester (500 g/L formulation) at 0.340 L/acre for additional control of lamb's-quarters, wild buckwheat, volunteer Smart Canola, stork's-bill, dandelion[2], narrow-leaf hawk's-beard[2], kochia, annual smartweed spp., and perennial sow-thistle[2].
- Pardner at 0.405 L / acre for additional control of weeds controlled by Pardner plus narrow-leaf hawk's-beard[3].
- MCPA ester (500 g/L formulation) at 0.385 L/acre for additional control of weeds listed on MCPA ester label plus narrow-leaf hawk's-beard[3], wild radish, volunteer sunflower, common plantain, and wild buckwheat[1].

[1] Suppression only

[2] Spring seedling are controlled and established plants are suppressed.

[3] Spring Seedlings only

Fertilizers: None

Insecticides: None

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Do not apply if rain is forecast during, or soon after, application.

Grazing: Do not graze in the year of treatment.

Pre-harvest interval: No information available on label. Contact manufacturer for information.

Recropping: Wheat (including durum), canola, barley, peas and flax may be grown the year after application. In fields with areas where organic matter content is less than 4 percent and with soil pH greater than 7.0 seed only wheat or SMART canola the year following application. Re-seed only to wheat in the year of application.

For all other crops, allow at least 22 months following application and conduct a field bioassay prior to planting.

Aerial Application: Do not apply by air.

Storage: Store under cool, dry conditions (below 50° C) away from foodstuffs, feed or seed.

Environment: Do not to water or contaminate water when draining sprayer. Maintain a buffer zone of 30m between the last spray swath and the edge of sensitive areas (shelterbelts, wood lots, or gardens). Leave a buffer zone of 6m between the last spray pass and wetlands or ponds. Use precautions to AVOID DRIFT. Drift may cause soil residues that will injure subsequent crops.

Tank Cleaning:

Do not clean sprayer in an area where waste may drain into water bodies. Prepare a solution of 1 percent household ammonia (1L of 3 percent ammonia per 100L water) to thoroughly rinse all surfaces and flush all hoses. Repeat and then rinse with clean water. Remove all nozzles and clean separately. Dispose of wash solution by spraying in a waste area or on the treated field.

Hazard Rating:

Sundance: Slight skin irritant.

Merge adjuvant: Warning poison; skin irritant.

Target

Herbicide Group – 4

(Refer to page 16)

Company:

Novartis Crop Protection

Formulation:

275 g/L MCPA, 62.5 g/L mecoprop and 62.5 g/L dicamba formulated as a solution.

Container size - 10 L.

Crops:

Spring wheat
 (including durum)
Barley
Oats
Canaryseed
Winter wheat
Fall stubble
Summerfallow

Seedling grasses grown
 for forage:
Creeping red fescue
Crested wheatgreass
Intermediate wheatgrass
Meadow foxtail
Orchardgrass
Smooth bromegrass
Timothy

Established forage grasses:
Timothy
Kentucky bluegrass
Meadow bromegrass
Intermediate wheatgrass
Streambank wheatgrass
Pubescent wheatgrass
Western wheatgrass
Creeping red fescue
Orchardgrass
Meadow foxtail
Smooth bromegrass
Crested wheatgrass
Slender wheatgrass
Tall wheatgrass
Meadow fescue
Tall fescue

Note: Target is registered by the federal government for use on seedling and established forage grasses. The data used in granting this registration was developed by groups other than Novartis Crop Protection. Novartis Crop Protection provides no warranty and holds no liability with respect to weed control or crop tolerance for the use of Target on seedling forage grasses.

Weeds:

Weeds Controlled:
Annual sow-thistle
Ball mustard
Cleavers
Common ragweed
Corn spurry
Cow cockle
Flixweed
Green smartweed
Hemp-nettle
Knotweed
Kochia
Prostrate pigweed
Redroot pigweed
Russian thistle
Shepherd's-purse
Stinkweed
Tall mustard
Tartary buckwheat
Volunteer canola
Volunteer sunflowers
Wild buckwheat
Wild mustard
Lady's-thumb
Lamb's-quarters
Night-flowering catchfly
Wormseed mustard
Yellow mustard

Top Growth Control:
Canada thistle
Field bindweed
Hedge bindweed
Perennial sow-thistle

Crop Stage:

Barley - 2 to 4 leaf stage.

Canaryseed, oats, wheat (spring and durum) - 2 to 5 leaf stage.

For optimum crop safety, apply at the 3 leaf stage of barley and the 3 to 4 leaf stage of wheat, oats, and canaryseed.

Winter wheat - spring application only; before the crop is more than 12 inches (30 cm) high (top leaf extended).

Seedling forage grasses - 2 to 4 leaf stage.

Established forage grasses - up to shot blade stage. Note, use only one application per year by ground.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 3 leaf stage.

Hemp-nettle before second pair of true leaves are formed.

Russian thistle - less than 2 inches (5 cm) tall.

Cleavers in the 1 to 2 whorl stage.

Canada thistle (fall stubble) - 6 to 8 inches (15 to 20 cm) and actively growing. Do not apply within 2 weeks of a killing frost.

Cost:

$4.77 to $7.13/acre (1999 suggested retail price).

Rate:

0.40 to 0.60 L/acre (one 10 L container treats 25 to 16.7 acres). Use the higher rate under adverse weather conditions, when weed density is high, for cleavers control, winter annual control and for suppression of Canada thistle and perennial sow-thistle.

Although Target is registered up to the 5 leaf stage of the crop for the rates listed here, the low rate should be used when the crop is at the 5 leaf stage for optimum crop safety.

For Canada thistle, postharvest or summerfallow application, use 0.81 L/acre (one 10 L container treats 12.4 acres).

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

200 to 300 kPa (30 to 45 psi).

Nozzles:

Flat fan with 50 mesh screens and filters.

How it Works:

Target is a systemic herbicide that is absorbed by foliage and by roots and is translocated throughout the plant. Symptoms include bending and twisting of stems and leaves within 3 to 7 days of application, and plant death 3 to 4 weeks after treatment.

Effects of Growing Conditions:

Hot and dry or cold and wet weather prior to spraying may result in reduced weed control and crop injury.

Tank Mixes:

Herbicides: Wheat - Target may be tank mixed with Horizon in spring wheat (including durum).

Wheat and Barley - may be mixed with Lexone/Sencor, Lorox or Afolan F for chickweed control.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze or harvest for livestock feed within 7 days of application.

Recropping: No restrictions the year after application.

Aerial Application: May be applied by air with a minimum of 3 gallons/acre (12 L/acre) water.

Storage: Do not freeze.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled broadleaf crops can be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Thumper

Herbicide Group – 4, 6

(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

280 g/L bromoxynil and 280 g/L 2,4 D ester formulated as an emulsifiable concentrate.

Container size - 8 L.

Crops:

Spring wheat (including durum), barley

Weeds Controlled and Staging:

Weeds controlled at the 1 to 4 leaf stage:

American nightshade
Ball mustard
Bluebur
Cocklebur
Common ragweed
Cow cockle
Flixweed
Green smartweed
Kochia[1]
Lady's-thumb
Night-flowering catchfly
Pale smartweed
Redroot pigweed
Russian thistle[1]
Shepherd's-purse
Volunteer canola
Volunteer sunflower

[1] Control before plants are 2 inches tall.

Weeds controlled at the 1 to 8 leaf stage:

Common groundsel
Lamb's-quarters
Stinkweed
Tame buckwheat
Tartary buckwheat
Wild buckwheat
Wild mustard

Crop Stage:

4 leaf to flag leaf stage.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Rates:

0.405 L/acre (one 8 L container treats 20 acres).

Cost:

$5.87/acre (1999 suggested retail price).

Water Volume:

5 - 10 gallons/acre (22 - 45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan nozzles. All strainer and nozzle screens must be 50 mesh or coarser.

How it Works:

Bromoxynil is a contact herbicide. Therefore, good coverage is essential. Susceptible weeds turn brown and die in 3 to 5 days. 2,4-D is absorbed through the leaves and is translocated throughout the plant, causing abnormal growth. Small burnt spots appear on leaves within hours, death of susceptible plants can take 2 weeks.

Effects of Growing Conditions:

Less than acceptable weed control may be expected if weeds are under stress because of excessive moisture, drought, or cool weather.

Tank Mixes:

Herbicides: May be tank mixed with Achieve, Horizon, Puma Super (wheat only, including durum), Avenge.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: No rainfast period is specified on the label; required interval may be up to 8 hours. Contact manufacturer for more information.

Grazing: Do not graze or cut for livestock feed within 30 days of application. Withdraw meat animals 3 days before slaughter.

Recropping: No recropping restrictions the year after application.

Aerial Application: May be applied by air in 3 to 4 gallons/acre (12 to 16 L/acre) water. Use the higher volume when there is a heavy crop canopy, or when the majority of weeds are cow cockle, smartweed, or pigweed.

Storage: May be frozen.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops can be severely injured by in-tank residues.

Do not clean equipment upslope of any water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison
Eye Irritant

Touchdown 480/640

See Glyphosate sections on pages 115-125

Trifluralin (Green and Yellow Foxtail Control in Cereals)

Herbicide Group – 3
(Refer to page 16)

Company:

AgrEvo Canada Inc. (Rival)
Dow AgroSciences Canada Inc. (Advance, Treflan)
United Agri Products (Bonanza)

Formulations:

Advance 10G - trifluralin formulated as a 10 percent granular in 22.7 kg and 454 kg bags.

Rival EC - trifluralin formulated as a 500 g/L emulsifiable concentrate in 9 L, 110 L, 200 L, 900 L containers.

Rival 10G - trifluralin formulated as a 10 percent granular in 22.7 kg, 567 kg bags.

Rival DF - trifluralin formulated as a 60 percent dry flowable in 7.5 kg bags.

Treflan EC - trifluralin formulated as a 480 g/L emulsifiable concentrate in 9.45 L, 115 L, 700 L containers.

Treflan QR5 - trifluralin formulated as a 5 percent granular in 25 kg, 725 kg bags.

Bonanza 400 - trifluralin formulated as a 400 g/L emulsifiable concentrate in 10 L, 115 L, 205 L containers.

Bonanza 10G - trifluralin formulated as a 10 percent granular in 22.7 kg and 500 kg bags.

Crops:

Liquids applied in spring (green and yellow foxtail control only) - spring wheat (including durum), barley. Granulars applied in fall (green and yellow foxtail control only) - spring wheat (including semidwarf and durum), barley.

Weeds:

Green and yellow foxtail.

Crop Stage:

Liquid and dry flowable formulations - spring applications only. After seeding but prior to crop emergence.

Granular formulations - fall applications only. After September 1 but before freeze-up.

Weed Stage:

Pre-emergence.

Rates:

LIQUID OR DRY FLOWABLES

PRODUCT	RATES (L OR KG/ACRE)	
	LIGHT AND MEDIUM SOIL TEXTURE	HEAVY SOIL TEXTURE
Rival EC	0.49 to 0.57 L	0.65 L
Rival DF	0.4 to 0.49kg	0.53 kg
Treflan EC	0.49 L	0.69 L
Bonanza 400	0.57 L	0.85 L

GRANULARS

PRODUCT	RATES (KG/ACRE)
	All soils 2 - 8% organic matter
Advance 10G/Rival 10G/Bonanza 10G	2.23
Treflan QR5	4.45

Cost:

Liquids and dry flowables - $6.27 to $9.49/acre.

Granulars - $6.98/acre (1999 suggested retail prices).

Water Volume:

10 gallons/acre (45 L/acre) - liquid and dry flowable formulations only.

Pressure:

275 kPa (40 psi) - liquid and dry flowable formulations only.

Nozzles:

Flat fan - liquid and dry flowable formulations only.

Incorporation:

Liquid or dry flowable formulations - Apply and incorporate in spring just after seeding. Incorporate to a depth of 1 to 1.5 inches (2 to 4 cm) into a trash-free soil (80 percent black when viewed from above) using diamond or tyne type harrows operated at a speed of 6 mph (9 km/h). Incorporate twice, with the second incorporation at right angles to the first. The first incorporation should be performed immediately in the same direction of application. Both incorporations should be done within 24 hours of application. When tank mixing liquid formulations with Avadex BW, follow the same incorporation procedure.

Granular formulations - May be applied to standing or pre-worked stubble. Very heavy trash fields should be worked prior to application to allow product penetration to the soil surface. Incorporate with cultivators or disc implements only. Perform the first tillage operation within 24 hours of application. Incorporate at a working speed of 5 to 8 mph (8 to 13 km/hr) and to a depth of 2 to 3 inches (5 to 8 cm). Wait a minimum of 5 days, then incorporate a second time at right angles to the first. This second incorporation may be delayed until the following spring. Subsequent working should be no deeper than 2 to 3 inches (5 to 8 cm).

How it Works:

Trifluralin inhibits growth of root and shoot tips as weeds germinate and begin to emerge. If the shoot portion of affected plants escapes to the soil surface, lateral and secondary root growth continues to be inhibited, which may result in a less competitive plant.

Effects of Growing Conditions:

When using fall applications of the granular formulations, crop injury will occur if soil conditions are not conducive to rapid wheat emergence (for example, cold or dry soil conditions). Weed control is best when soil moisture conditions are good.

Rainfall has no direct effect on product activity. Flooding (3 to 5 days) will cause the rapid breakdown of the product, resulting in reduced weed control. Flooding for 3 weeks or more will result in total product breakdown and loss of weed control.

Tank Mixes:

Herbicides: Liquid trifluralin and Rival DF may be tank mixed with Avadex BW.

Fertilizer: Liquid trifluralin and Rival DF may be applied with liquid fertilizer (for example 28-0-0) as a carrier. Conduct a compatibility test before mixing.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: None. Flooding can reduce weed control.

Grazing: Do not graze the treated crop or cut for feed prior to crop maturity.

Aerial Application: Do not apply by air.

Recropping: Do not sow tame oats, canaryseed or small seeded forage grasses one year after spring applications or 21 months after fall applications.

Storage: Granular formulations must be stored in a cool, dry location, out of sunlight.

Rival EC - Do not store below 5°C.

Treflan E.C. - Do not freeze.

Bonanza 400 - Do not freeze.

Recommendations for liquid formulations: Crystalization of the active ingredient may occur at less than 5°C. To reconstitute, bring temperature to 15°C and shake well until no crystals are visible. This should be done before adding to the spray tank.

Tank Cleaning:

Immediately after spraying, throughly clean with a water/detergent mix.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Keep out of reach of children.

Trifluralin (Broadleaf and Grassy Weed Control)

Herbicide Group – 3

(Refer to page 16)

Company:

AgrEvo Canada Inc. (Rival)
Dow AgroSciences (Advance, Treflan)
United Agri Products (Bonanza)

Formulations:

Advance 10G - trifluralin formulated as a 10 percent granular in 22.7 kg and 454 kg bags.

Rival EC - trifluralin formulated as a 500 g/L emulsifiable concentrate in 9 L, 110 L, 200 L, and 900 L containers.

Rival 10G - trifluralin formulated as a 10 percent granular in 22.7 kg, 567 kg bags.

Rival DF - trifluralin formulated as a 60 percent dry flowable in 7.5 kg bags.

Treflan EC - trifluralin formulated as a 480 g/L emulsifiable concentrate in 9.45 L, 115 L, 700 L containers.

Treflan QR5 - trifluralin formulated as a 5 percent granular in 25 kg, 725 kg bags.

Bonanza 400 - trifluralin formulated as a 400 g/L emulsifiable concentrate in 10 L, 115 L, 205 L containers.

Bonanza 10G - trifluralin formulated as a 10 percent granular in 22.7 kg, 500 kg bags.

Crops:

Certain formulations are not registered for all the crops listed here. Refer to the specific product label for details.

Spring applied liquid, dry flowable or granular formulations - canola, peas, sunflowers, safflower (liquid formulations), dry beans, mustard, fababeans, alfalfa, sainfoin, sweet clover, soybeans, forage legumes (cicer milk-vetch, seedling alsike clover, red clover, bird's-foot trefoil).

Fall applied granular formulations - canola, peas, sunflowers, dry beans, mustard, fababeans, soybeans, barley, lentils and flax.

Trifluralin liquids, Rival DF - prior to planting shelterbelt transplants (elm, caragana, green ash, Scots pine).

Weeds:

Wild oats
Green foxtail
Yellow foxtail
Barnyard grass
Persian darnel
Purslane
Wild buckwheat
Pigweed
Russian thistle*
Lamb's-quarters
Chickweed
Knotweed
Cow cockle

*Bonanza only.

Crop Stage:

Preplant incorporated.

Weed Stage:

Pre-emergence.

Costs:

Liquids or dry flowable - $8.55 to $15.19/acre.

Granulars - $10.73 to $21.53/acre (1999 suggested retail prices).

Water Volume:

10 gallons/acre (45 L/acre) (liquid or dry flowable products only).

Pressure:

275 kPa (40 psi) (liquid or dry flowable products only).

Nozzles:

Flat fan (liquid or dry flowable products only).

Incorporation:

Granular formulations are recommended for use in fall or spring as a preplant incorporated treatment on broadleaf crops listed on the product label. The liquid or dry flowable formulations should be used only on soils free of lumps and relatively trash-free (75 percent black) and are recommended only for spring use. Granular formulations may be applied to standing or pre-worked stubble. Very heavy trash fields should be worked prior to application to allow product penetration to the soil surface. Do not use liquid or dry flowable formulations of trifluralin as a preplant incorporated treatment in barley, as severe injury will result. Only the fall applications of Advance 10G, Rival 10G, Bonanza 10G or Treflan QR5 are registered for use as preplant incorporated treatments in barley.

For fall application of granular formulations, work the chemical into the soil between September 1 and freeze-up. Use a discer or field cultivator (vibrating shank-type). Disc implements are preferred on stubble. Set equipment to cut at 3 to 4 inches (8 to 10 cm) depth. The initial incorporation should be done within 24 hours of application. The second incorporation should be done at right angles to the first.

The second incorporation may be delayed until spring, except when planting barley, flax or lentils; for these crops both incorporations must be done in fall. Delay the second incorporation 5 days for better weed control. This will allow greater release of the chemical onto soil particles and assure more even distribution. Fall application of granular trifluralin on flax, lentils or barley is not recommended on soils prone to erosion, as the 2 fall incorporations necessary in these crops may leave soils vulnerable to wind or water erosion.

For spring application of liquid and granular formulations, work the chemical into the soil prior to seeding by setting the implement at 3 to 4 inches (8 to 10 cm) cutting depth. The first incorporation must be done within 24 hours of application. The second incorporation must be done at right angles to the first. If incorporating granular trifluralin, delay the second incorporation for 3 days after the first to achieve better weed control.

How it Works:

Trifluralin inhibits growth of root and shoot tips as weeds germinate and begin to emerge. If the shoot portion of affected plants escapes to the soil surface, lateral and secondary root growth continues to be inhibited, which may result in a less competitive plant.

Effects of Growing Conditions:

Injury to flax, barley or lentils may occur if soil and weather conditions are not conducive to rapid crop emergence (cold or dry soils at the time of seeding and crop emergence).

To minimize crop injury, seed into a firm, moist seed bed. Use a press drill or hoe-drill. Sow barley no deeper than 2 inches (5 cm). Sow lentils and flax no deeper than 1.5 inches (4 cm).

Less than acceptable weed control will result if dry conditions prevail at the time of weed emergence.

Rainfall has no direct effect on products' activity. Flooding (3 to 5 days) will cause rapid breakdown of the product resulting in reduced weed control. Flooding for 3 weeks or more will result in total breakdown of the product resulting in loss of weed control.

Tank Mixes:

Herbicides:

Fababeans - Treflan EC may be tank mixed with Sencor 75 DF or Sencor 500.

Peas - Treflan EC may be tank mixed with Sencor.

Soybeans - Treflan EC can be tank mixed with Sencor 500 (use only on KG 20 or McCall). This mixture may cause injury to soybeans if seedlings are weak or slow to emerge.

Dry beans (white and red kidney only) - Treflan and Rival (liquid formulations) may be tank mixed with Eptam 8-E.

Fertilizers: Liquid product and Rival DF may be applied with liquid fertilizer as a carrier. Before the herbicide is added to the tank, compatibility of the herbicide to liquid fertilizer should be tested following instructions on the herbicide container. Trifluralin liquids may be blended with dry bulk fertilizers (do not mix with nitrate fertilizers). Check label for blending instructions.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Rates:

For use in canola, peas, sunflowers, dry beans, mustard, fababeans, seedling alfalfa (spring only), seedling sweet clover (spring only), soybeans. Apply:

PRODUCT	SOIL TYPE			
	Light soils with less than 6% organic matter		Medium to heavy soils with 6 - 15% organic matter	
	Spring	Fall	Spring	Fall
Advance 10G	Not registered	4.45 kg/acre	Not registered	5.67 - 6.88 kg/acre
Rival EC	0.65 L/acre	0.89 L/acre[1]	0.89 - 1.13 L/acre	1.13 - 1.37 L/acre[1]
Rival 10G	3.43 kg/acre[2]	4.45 kg/acre	4.45 - 5.67 kg/acre[2]	5.67 - 6.88 kg/acre
Rival DF	0.53 kg/acre	0.73 kg/acre[1]	0.73 - 0.93 kg/acre	0.93 kg/acre[1]
Treflan EC	0.69 L/acre	0.93 L/acre[1]	0.93 - 1.21 L/acre	1.21 - 1.37 L/acre[1]
Treflan QR5	6.9 kg/acre[2]	8.9 kg/acre	8.9 - 11.3 kg/acre[2]	11.3 - 13.8 kg/acre
Bonanza 10G	Not registered	4.45 kg/acre	Not registered	5.67 - 6.88 kg/acre
Bonanza 400	0.81 L/acre	1.11 L/acre[1]	1.11 L/acre	1.42 L/acre[1]

[1] Although liquid and dry flowable formulations are registered for fall application, this use is not recommended as tillage requirements before and after application will predispose fields to erosion.

[2] Spring applications of granular formulations is recommended for Manitoba only.

For use in barley (fall only), apply:

PRODUCT	SOIL TEXTURE		
	Light textured soils (2-4% organic matter)	Medium to heavy textured soils (4-6% organic matter)	Heavy textured soils (6-10% organic matter)
Advance 10G, Rival 10G Bonanza 10G	3.44 kg/acre	4.45 kg/acre	5.67 kg/acre
Treflan QR5	8.9 kg/acre	11.3 kg/acre	Not recommended

For use in flax or lentils (fall only), apply:

PRODUCT	SOIL TEXTURE	
	Light textured soils with less than 6% organic matter	Medium to heavy textured soils with 6-15% organic matter
Advance 10G, Rival 10G, Bonanza 10G	4.45 kg/acre	5.67 - 6.88 kg/acre
Treflan QR5	8.9 kg/acre	11.3 - 13.8 kg/acre

Restrictions:

Rainfall: None. Flooding may reduce weed control.

Grazing: Do not graze the treated crops or cut for feed prior to crop maturity.

Recropping: Oats, canaryseed, and small-seeded grasses may be affected the year after treatment. Corn is sensitive at higher rates of application. Damage to wheat can occur if the crop is seeded into land that has been treated during the previous 21 months with trifluralin products and has received abnormally low amounts of precipitation. Damage is worse if conditions are not conducive to rapid emergence of the wheat (for example, if the crop is seeded deep or if soil conditions remain cool during emergence). Damage tends to be greater on fields treated with granular formulations.

Aerial Application: Do not apply by air.

Storage: Granular formulations must be stored in a cool, dry location, out of sunlight.

Rival EC - Do not store below 5°C.

Treflan E.C. - Do not freeze.

Bonanza 400 - Do not freeze.

Recommendations for liquid formulations: Crystalization of the active ingredient may occur at less than 5°C. To reconstitute, bring temperature to 15°C and shake well until no crystals are visible. This should be done before adding to the spray tank.

Tank Cleaning:

Immediately after spraying, thoroughly clean with a water/detergent mix.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Keep out of reach of children.

Triumph Plus

Herbicide Group – 1, 2, 4

(Refer to page 16)

Company:

AgrEvo Canada Inc.

Formulation:

The Triumph Plus package contains 4 containers: 2 labelled "Triumph FM" and 2 labelled "Plus".

"Triumph FM" contains 56 g/L fenoxaprop-p-ethyl and 256 g/L MCPA ester formulated as an emulsifiable concentrate. Container size - 13.3 L.

"Plus" contains 75 percent thifensulfuron methyl formulated as a dry flowable. Container size - 162 g.

Crops:

Spring wheat (except durum), seedling grasses for forage and seed production (tall fescue, creeping red fescue, smooth bromegrass, meadow bromegrass, intermediate, slender, western, tall and northern wheatgrass).

Weeds Controlled and Staging:

Wild oats
Green foxtail
Yellow foxtail
Annual sunflower
Ball mustard
Vetch
Wild radish
Corn spurry
Cow cockle
Green smartweed

Burdock
Cocklebur
Field horsetail
  (top growth control only)
Flixweed
  (spring seedlings only)
Russian thistle
Stinkweed
  (spring seedlings only)
Volunteer canola[1]
Plantain (top growth
  control only)
Prickly lettuce
Ragweeds'
Russian pigweed
Shepherd's-purse
  (spring seedlings only)
Hemp-nettle
Lady's-thumb
Redroot pigweed
Lamb's-quarters
Hoary cress
  (top growth control only)
Kochia
Mustards
  (except dog and green
  tansy)
Wild mustard
Canada thistle
  (suppression only)
Chickweed (1 to 6 leaf)
Wild buckwheat (1 to 3 leaf)

[1] May not give satisfactory control of Smart canola varieties.

Unless otherwise specified, control weeds at the following stages:

Annual grass weeds - 1 to 6 leaf stage with a maximum of 2 tillers. Apply at the 2 to 3 leaf stage for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Broadleaf weeds - 2 to 4 leaf stage or less than 4 inches (10 cm) tall or across.

Crop Stage:

Spring wheat (except durum) - 2 to 6 leaf with a maximum of 3 tillers.

Seedling forage grasses - 2 to 4 leaf stage.

Crop injury (yellowing, stunting and in some instances pinching of tillers) can occur with applications of Triumph Plus made beyond the recommended leaf stage. Roblin wheat is particularly sensitive to applications of Triumph Plus made at leaf stages beyond the recommended range. To minimize the risk of injury, apply the product within the recommended range.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Cost:

$20.75/acre (1999 suggested retail price).

Rates:

The Triumph Plus package will treat 40 acres.

Refer to the product label for complete mixing instructions. A general guide to mixing can be found on page 26.

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° stainless steel flat fan nozzles tilted forward at a 45° angle. Screens 50 mesh or larger.

How it Works:

Triumph Plus is a systemic herbicide that is translocated throughout treated plants. Symptoms on grassy weeds include reduced leaf growth and chlorosis (yellowing) of treated leaves within 1 to 3 days. Yellowing progresses and death of grassy weeds occurs 14 to 21 days after application. Broadleaf weeds are affected by two different components in Triumph Plus. MCPA causes rapid, abnormal, undifferentiated growth in weeds which results in plant death. Plus is usually slow to act and symptoms, which include discolouration (reddening, purpling or yellowing), may not be noticeable for 1 to 3 weeks after application.

Effects of Growing Conditions:

Do not apply to crop that is stressed by severe heat, frost, low fertility, drought, water-saturated soil, disease or insect damage as crop injury and poor weed control may result.

Tank Mixes:

Herbicides: In spring wheat (not durum), Triumph Plus may be tank mixed with 0.085 L/acre of Lontrel.

Fertilizers: None registered.

Insecticides: None registered.

Do not tank mix with any other chemical additive, pesticide or fertilizer. Do not use a surfactant with this tank mix. An interval of 7 days prior to application, or 4 days after application with Triumph Plus, is required before any other pesticide can be applied.

Adding ingredients in the correct order is critical for optimum performance. Check labels of products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours may reduce weed control.

Grazing: Do not graze treated crops or cut for feed prior to crop maturity.

Preharvest: Do not apply within 80 days of harvest.

Recropping: No restrictions the year after treatment.

Aerial Application: Do not apply by air.

Storage: Do not freeze. If stored for 1 year or longer, shake well before using.

Environment: Do not apply within 15 m of a body of water or wetland area.

Tank Cleaning:

The "Plus" component of Triumph Plus can cause severe injury to sensitive crops at very low concentrations. Sprayers used to apply Triumph Plus should be flushed out immediately after Triumph Plus is used. The manufacturer recommends that sprayers used to apply this product be flushed twice with a water/household ammonia (1L of 3% household ammonia per 100 L water) rinse prior to using the sprayer on sensitive crops. All nozzles, screens and filters should be removed and cleaned after applying this product. Refer to label for detailed clean out instructions. Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Warning Poison
Skin and Eye Irritant

Unity 280 EC plus Unity 75 WG Tank Mixture

(Not for use in Manitoba)

Herbicide Group – 2,6
(Refer to page 16)

Company:

Rhone Poulenc Canada Inc.

Formulation:

Unity 280 EC - 280 g/L bromoxynil formulated as an emulsifiable concentrate.

Unity 75 WG - 75 percent triasulfuron formulated as a dispersible granule.

Container size - one case of Unity 280 EC plus Unity 75 WG contains 2 x 4 L jugs of Unity 280 EC and 4 x 43 g water soluble bags of Unity 75 WG.

Crops:

Spring wheat (including durum), and barley. For use in the brown and dark brown soil zones of Saskatchewan only.

Weeds:

Chickweed
Cleavers
Cow cockle
Flixweed
Green smartweed
Hemp-nettle
Kochia
Lady's-thumb
Lamb's-quarters
Redroot pigweed
Shepherd's-purse
Stinkweed
Wild buckwheat
Wild mustard
Volunteer canola

Caution:

Several crops are sensitive to low concentrations of Unity 75 WG in the soil. Therefore, careful consideration should be given to crop rotation plans prior to using. The Unity tank mix is registered for use in Saskatchewan in the brown and dark brown soil zones only. The degradation of Unity 75 WG in the soil is affected by rainfall, soil temperature and soil pH. If you are considering using this product, be sure to read the recropping restrictions outlined in the product label.

Crop Stage:

2 leaf to just prior to flag leaf.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

Weed Stage:

2 to 4 leaf stage.

Cost:

$6.90/acre (1999 suggested retail price).

Rates:

One case treats 40 acres. Add a recommended non-ionic surfactant such as Citowett Plus, Agral 90, Agsurf, Agsurf, Super Spreader Sticker or Companion at 0.25 L per 100 L spray solution.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Water Volume:

10 gallons/acre (45 L/acre).

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan. 50 mesh screens or coarser.

Mixing Instructions:

Add Unity 75 WG water soluble bags first to 1/4 full sprayer. Allow at least 6 minutes for complete mixing. Add Unity 280 EC. Allow a further two minutes mixing. Fill sprayer, and add surfactant. Do not allow mixture to stand without agitation.

How it Works:

The Unity tank mix is absorbed through the leaves of emerged weeds and is rapidly translocated to the growing points of roots and shoots, where growth is inhibited. Visual symptoms take 1 to 3 weeks to appear, and death usually occurs in 3 to 4 weeks.

Effects of Growing Conditions:

Adequate control may not be achieved under unfavourable conditions such as drought, flooding or prolonged temperature extremes.

Tank Mixes:

Herbicides: May be tank mixed with Horizon, Puma.

Fertilizers: None registered.

Insecticides: None registered.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Do not apply if rainfall is expected within 2 hours.

Grazing: Do not graze treated crops or cut for hay until 30 days after application.

Recropping: Some crops have shown a high sensitivity to low residues of Unity 75 WG in the soil. The risk of injury to rotational crops is affected by a number of factors including soil factors (soil type and soil pH), environmental factors (soil temperature, precipitation), crop species, and recropping interval. Breakdown in soil of Unity 75 WG is more rapid with conditions of high moisture, high temperature, and low pH.

To avoid injury to subsequent crops after an application of recommended rates of the Unity tank mix, the following recropping intervals should be observed:

CROP	MINIMAL INTERVAL (MONTHS)		
	Soil pH 6.4 or less	Soil pH 6.5 - 7.4	Soil pH 7.5 or greater
Spring Wheat (Hard Red, Canada Prairie, Extra Strong)	No Restrictions	No Restrictions	No Restrictions
Barley, Oats, Durum Wheat	10	10	10
Flax	10	10	22
Peas	10	22	22
Canola	10	22	34
Canaryseed	22	22	22
Mustard	22	22	34
Lentils, Sunflowers, All Other Crops	Bioassay	Bioassay	Bioassay

A field bioassay involves growing test strips of the crop(s) intended for production the following year in fields previously treated with the Unity tank mix. Crop response will dictate whether or not to rotate to the crop(s) used in the test strip. See Bioassay Guidelines section of product label. Apply the Unity tank mix only once per year to the same field.

Aerial application: Do not apply by air.

Storage: Do not freeze.

Environment: Leave at least a 15 m buffer zone around wildlife habitat. Do not apply to irrigated land.

Tank Cleaning:

Unity can cause injury to sensitive crops at low concentrations. Clean sprayer immediately after use. Do not clean near desirable vegetation, wells or other water sources. Drain and flush tank and boom with water and household detergent. Add 1 L household ammonia (3 percent) and 100 L water to spray tank and allow to agitate for 15 min. before flushing through nozzles. Wash nozzles and screens in the water/ammonia mix in pail. Rinse system with clean water for 5 minutes.

Hazard Rating:

Warning Poison

Velpar DF

Herbicide Group – 5

(Refer to page 16)

Company:

DuPont Canada Inc.

Formulation:

Velpar DF: 75 percent hexazinone formulated as a water dispersible granule - Container size: 2 kg.

Crops:

Established alfalfa for seed.

Weeds:

Dandelion
Quackgrass
Sow-thistle
Narrow-leaf hawk's beard
Scentless chamomile

Crop Stage:

Apply in late fall prior to freeze-up when alfalfa is dormant or in early spring before alfalfa growth resumes. Apply only on alfalfa that has been established for 18 months or longer. If burning or irrigation is to be carried out, do not apply until these operations have been completed.

Weed Stage:

Dormant (after growth has ceased in fall or prior to growth resuming in spring).

Do not apply to frozen ground.

Cost:

$20.35 to $40.73/acre (1999 suggested retail price).

Rates:

Velpar DF - 0.272 to 0.544 kg/acre. Use the lower rate on medium-textured soils with low organic matter. Do not apply to soils with less than 1 percent organic matter.

Water Volume:

20 gallons/acre (90 L/acre).

Pressure:

200 to 275 kPa (30 to 40 psi).

Nozzles:

Flat fan.

How it Works:

Velpar is a systemic herbicide readily absorbed through the roots and foliage. It is translocated upwards, where it inhibits photosynthesis.

Effects of Growing Conditions:

Adequate soil moisture is required for activation of the product.

Tank Mixes:

Herbicides: None registered.

Fertilizers: None registered.

Insecticides: None registered.

Restrictions:

Rainfall: Rainfall is beneficial for activation of the product.

Grazing: Do not graze the treated crop or cut for feed.

Recropping: Insufficient information is available. Velpar residues will persist for 2 or more years after application.

Aerial Application: Do not apply by air.

Storage: May be frozen.

Tank Cleaning:

The manufacturer does not provide enough information on tank cleaning to make recommendations.

Non-labelled crops may be injured by in-tank residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Danger Corrosive
Caution Flammable

Venture 25 DG

Herbicide Group – 1

(Refer to page 16)

Company:

Zeneca Agro

Formulation:

25 percent fluazifop-p-butyl formulated as a dispersible grain. Container size - 6.4 kg plus 2 x 8 L Charge or 1 x 8 L Turbocharge adjuvant.

Crops:

Canola, triazine-tolerant canola (TTC), flax (including low linolenic acid varieties), lentils, peas, mustard, sunflowers, alfalfa, red clover, bird's foot trefoil, creeping red fescue (seedling and established).

Crop Stage:

Broadleaf crops are tolerant at all stages, however, the preharvest intervals outlined in the accompanying table must be followed to avoid unacceptable residues of fluazifop-p-butyl in harvested crops.

When tank mixing, always check the tank mix partner recommendations for additional staging restrictions.

CROP	MAXIMUM RATE (KG/ACRE)	APPLICATION INTERVAL TO HARVEST
Canola	0.28	80
Flax	0.28	80
Lentils	0.28	70
Peas	0.28	66
Mustard	0.28	75
Sunflowers	0.28	120
Creeping Red Fescue	0.28	For seed only
Alfalfa	0.28	41
Bird's foot trefoil, red clover	0.28	Do not graze or feed in year of treatment

Weeds and Rates:

WEED	RATE (KG/ACRE)	ACRES TREATED PER 6.4 KG CONTAINER
Volunteer corn	0.12	52.7
Volunteer wheat and barley, wild oats, Persian darnel, barnyard grass	0.16	40
Quackgrass (suppression, canola only)	0.20	32
Green and yellow foxtail, quackgrass (suppression, all crops)	0.28	22.6

Add Turbocharge at a rate of 0.5 L per 100 L of spray solution.

Refer to the product label for complete mixing instructions for this product and its mixes. A general guide to mixing can be found on page 26.

Weed Stage:

2 to 5 leaf stage for annual grasses, except green and yellow foxtail (2 to 4 leaf stage). Apply at the 2 to 3 leaf stage of annual grasses for optimum control. Optimum weed control and yield response occurs when weeds are removed before tillering.

Quackgrass - 3 to 5 leaf stage.

Cost:

$8.44 to $19.69/acre (1999 suggested retail price).

Water Volume:

5 to 10 gallons/acre (23 to 45 L/acre).

Do not apply with air-assist sprayers set to apply less than 5 gallons/acre (23 L/acre) as mixing problems could result.

Pressure:

275 kPa (40 psi).

Nozzles:

80° or 110° flat fan nozzles. All strainer and nozzle screens must be 50 mesh or coarser.

Mixing Instructions:

Fill the sprayer three-quarters full of water. Start the agitation system and continue agitating throughout the mixing and loading procedure. Add the Venture 25 DG slowly to the tank. Venture 25 DG must be added directly through the tank opening into the water. Add all the Venture required to spray to the tank, wait 1 minute for the Venture grains to disperse, add the broadleaf chemical (if tank mixing) and then add the required amount of Turbocharge adjuvant. Fill the sprayer to the desired level with water. Continue to agitate until spraying is complete.

How it Works:

Venture is a systemic herbicide that is absorbed through foliage and translocated from treated leaves to growing points within plants. Symptoms include yellowing of newest leaves within 1 to 3 days, which leads to browning and plant death 21 to 28 days after treatment.

Effects of Growing Conditions:

Less than acceptable weed control may be expected if weeds are under stress because of excessive moisture, drought or cool weather.

Tank Mixes:

Herbicides: Canola - Venture 25 DG may be tank mixed with Lontrel or Muster (Argentine varieties only for Muster tank mixes). Venture DG may be tank mixed at 0.04 to 0.08 kg/acre with Liberty at 1.1 L/acre for control of volunteer barley in Liberty Link varieties only.

Canola and flax -Venture 25 DG may be tank mixed at 0.08 kg/acre with Poast Ultra (184 g/L) at 0.22 L/acre. Merge or Turbocharge must be added at 0.7 L per 100 L spray solution. Venture 25 DG may be tank mixed at 0.08 kg/acre with Select at 0.03 L/acre. Add Amigo or Turbocharge, or a combination of the two adjuvants, so that the final adjuvant concentration is 0.5 to 1 L per 100 L spray solution.

TTC - Venture 25 DG may be tank mixed with Bladex L, Lontrel or Muster.

Alfalfa and bird's-foot trefoil - Venture 25 DG may be tank mixed with 2,4-DB.

Field peas - Venture 25 DG may be tank mixed at 0.28 kg/acre with Pursuit at 0.085 L/acre. This tank mix may result in a 10 percent reduction in grassy weed control.

Creeping Red Fescue (Seedling and Established) - Ally at 0.002 to 0.003 kg/acre at the 2 to 5 leaf stage.

Fertilizers: None registered.

Insecticides: None registered.

When applying other broadleaf herbicides in the same field, apply the product no sooner than 3 days after application of Venture 25 DG.

Adding ingredients in the correct order is critical for optimum performance. Check labels of both products to be mixed for directions. General guidelines can be found on page 26.

Restrictions:

Rainfall: Within 2 hours will reduce weed control.

Grazing: Do not graze or harvest legumes for feed in year of treatment, except alfalfa. Do not graze treated alfalfa or cut for feed within 41 days of treatment.

Recropping: Do not sow cereals, corn, or forage grasses in the year of treatment.

Aerial application: Do not apply by air.

Storage: May be frozen. Store in a cool, dry place.

Environment: Do not apply within 15 m of fish-bearing waters and wildlife habitats.

Tank Cleaning:

When spraying is completed, thoroughly rinse tank with clean water. Using a pressure washer and adding a detergent or Agral 90, Agsurf to the rinse water will enhance removal of residues.

Do not clean equipment upslope of water bodies or ditches, near cropland or shelterbelts. Clean your sprayer away from areas where family members or others are likely to frequent or walk.

Hazard Rating:

Caution Poison

Experimental studies have shown that the active ingredients in this product may cause birth defects in laboratory animals. Women capable of bearing children should avoid contact with this product.

Special Weed Problems

This section identifies specific weeds and some herbicides recommended for control. Refer to the particular crop section or the product label for information on specific products that may be used on the crops and for application instructions.

Absinth

2,4-D LV Ester (500 g/L) - In grass pastures with no legumes, spray 1.82 L/acre in late June, prior to flowering. Re-treat regrowth in late summer when plants have 6 to 10 inches (15 to 25 cm) of new growth. More than 1 season of treatment may be required.

Alders

2,4-D LV Ester (500 g/L) - In grass pastures and non-crop land, apply 1.78 L/acre to the foliage of actively growing brush.

Banvel II + 2,4-D amine or LV ester (500 g/L) - In grass pastures, rangeland and non-crop land, apply Banvel II at 2.1 L per 1,000 L of water with 2,4-D LV ester or amine at 4.0 L per 1,000 L of water to the foliage of actively growing brush in the spring or early summer and wet the foliage until the point of runoff.

Aspen Poplar (Trembling Aspen)

Banvel II + 2,4-D amine or LV ester (500 g/L) - In grass pastures, rangeland and non-crop land, apply Banvel II at 1.32 L/acre with 2,4-D LV ester or amine at 1.78 L/acre in 20 gallons/acre (90 L/acre) water to the foliage of actively growing brush in spring or early summer.

Baby's Breath (Perennial)

Banvel II - In grass pastures with no legumes, apply 3.72 L/acre in 10 to 20 gallons/acre (45 to 90 L/acre) water when actively growing.

Biennial Wormwood

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 L/acre to the foliage of actively growing plants.

Black Medic

Buctril M/Dichlorprop +2,4-D/Mecoprop/Target/2,4-D amine or LV ester - Apply in registered crops at registered rates to black medic in the 1 to 4 leaf stage for suppression only.

Chokecherry

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 L/acre to the foliage of actively growing brush.

Common Tansy

Glyphosate - Apply at 1.9-2.8 L/acre in 10 gallons of water/acre (40 L/acre) to actively growing plants that are 8-10 inches (20-25 cm) tall (summerfallow, stubble and non-cropland).

Escort - In pastures, rangeland and rough turf, apply 8 g/acre in 10 to 20 gallons/acre (45 to 90 L/ acre) of water to actively growing plants of less than 4 inches (10 cm) tall. Add Agral 90, Agsurf, or Citowett Plus at 0.2 L per 100 L of spray solution.

Curled Dock

Banvel II - As a patch treatment, apply 0.92 L/acre Banvel II in 10 to 20 gallons/acre (45 to 90 L/acre) water to actively growing weeds for top growth control.

Glyphosate - As a spot treatment, apply 2.83 to 4.86 L/acre in 10 gallons/acre (45 L/acre) water when most plants have reached the early bud stage. Do not disturb treated plants for at least 10 days following treatment.

MCPA amine, 2,4-D amine - Apply 0.445 to 0.69 L/acre of formulations containing 500 g/L MCPA or 2,4-D amine to give top growth control.

Dichlorprop + 2,4-D - 0.71 L/acre for suppression before plants are 2 inches (5 cm) tall.

Diffuse Knapweed

Banvel II - In grass pastures, rangeland and non-crop land, apply Banvel II at 1.86 L/acre in 10 to 20 gallons/acre (45 to 90 L/acre) water to actively growing weeds.

Downy Brome

Glyphosate - Prior to crop emergence, apply 0.51 to 0.77 L/acre in 5 to 10 gallons/acre (23 to 45 L/acre) water before downy brome is 6 inches (15 cm) in height.

Rustler - Prior to crop emergence, apply 1.0 L/acre in 5 to 10 gallons/acre (23 to 45 L/acre) water between emergence and heading of downy brome.

Field Bindweed

Banvel II - As a patch treatment, apply 1.0 L/acre Banvel II in 10 to 20 gallons/acre (45 to 90 L/acre) water. Apply when field bindweed is in the flowering stage and allow 3 weeks after treatment before resuming normal summerfallow tillage.

Basagran - In labelled crops, apply 0.71 L/acre followed by 0.71 L/acre 7 to 10 days later. Apply in 20 to 35 gallons/acre (90 to 160 L/acre) water before field bindweed has developed a dark green colour and before it has begun trailing. Use a recommended surfactant (see recommendations under the appropriate crop).

2,4-DB - As a spot treatment in labelled crops apply 2.83 to 4.86 L/acre in 10 gallons/acre (45 L/acre) water at the bud stage. Do not disturb plants for at least 10 days following treatment. Heavy rainfall within 2 hours of application may wash chemical off the foliage and a repeat treatment may be required. Rainfall occurring within 6 hours after application may reduce control.

2,4-D amine - In grass pastures containing no legumes or as a spot treatment, apply 1.82 L/acre of formulations containing 500 g/L 2,4-D amine at early flowering stage.

Glyphosate - As a spot treatment, apply 2.8 to 4.9 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) at the full bloom stage or beyond. Allow 7 or more days after application before tillage.

Field Horsetail

MCPA amine, potassium and sodium salt mixtures - Apply 0.57 L/acre of formulations containing 500 g/L MCPA after the weeds have fully emerged for top growth control. May be used in wheat, oats, barley, flax and rye.

Amitrol 240 - Apply 8.9 to 14.2 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in non-cropped areas and pastures when the weed is young and actively growing.

Foxtail Barley

Gramoxone - Apply 2.23 L/acre in 98 gallons/acre (445 L/acre) water or 75 mL in 2.2 gallons (10 L) water/1076 square feet (100 sq. m) for top growth control only.

Kerb 50-W - Apply 0.364 to 0.445 kg/acre product in 20 gallons/acre (90 L/acre) water between October 1 and freeze-up. Use the lower rate on grey-wooded soils or where perennial bluegrass or fescues are the predominant pasture species. Do not use Kerb for foxtail barley removal in seed grass stands or desired foliage stands of timothy or fescue grass species. At recommended rates, pasture stands of perennial bluegrass and fescue may be reduced by 10 to 15 percent. Where perennial bluegrass and fescues are the dominant pasture species, use the lower rate of Kerb. Spray overlaps may seriously harm desirable pasture grass species. Where the grass stand comprises mostly foxtail barley and reseeding to a desirable grass species is required, delay seeding into the Kerb-treated soil until the end of June. Do not harvest or graze within 60 days of application with Kerb. Avoid using Kerb on soils having more than 6 percent organic matter.

Glyphosate - Prior to crop emergence, apply 1 to 2 L/acre in 5 to 10 gallons/acre (23 to 45 L/acre) water to foxtail barley at the seedling to heading stage. Late fall applications may provide better control of established plants than spring applications.

Roundup Transorb - In Roundup ready canola, apply 2 applications, each at 0.5 L/acre, for season long control.

Rustler - Prior to crop emergence, apply 1.26 L/acre in 5 to 10 gallons/acre (23 to 45 L/acre) water to foxtail barley before initiation of the seed head for suppression only.

Goat's-Beard

2,4-D amine - Apply 0.91 L/acre of formulations containing 500 g/L in early fall or early spring.

Dichlorprop + 2,4-D - Apply 1.62 L/acre in early spring or fall.

Gumweed

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 0.89 L/acre to the foliage of actively growing plants.

Hemp Dogbane

Glyphosate - Apply 2.83 to 4.86 L/acre when hemp dogbane is in the early bud stage. Apply in 10 gallons/acre (45 L/acre) water. Do not disturb treated plants for at least 7 days after application.

2,4-D amine or LV ester - Apply 1.38 to 1.82 L/acre of formulations containing 500 g/L 2,4-D in fall before frost and while plant leaves are green.

Hoary Cress

Amitrol 240 - For non-selective patch treatment in pastures and non-crop land, apply 8.9 to 13.8 L/acre.

Glyphosate - As a spot treatment in labelled crops, apply 2.83 to 4.86 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water when most plants have reached the early bud stage. Do not disturb treated plants for at least 10 days following treatment.

Leafy Spurge

Amitrol 240 - Apply 18 to 22 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in non-cropped areas and pastures when the weed is between the late stages of flowering and early seed development.

Banvel II - Apply 0.84 L/acre Banvel II in 10 to 20 gallons/acre (45 to 90 L/acre) water for top growth control when the weed is actively growing.

2,4-D amine - Apply 1.82 L/acre of formulations containing 500 g/L 2,4-D at early flowering stage. Repeat at least once to new growth later in the season. Control of established plants and new seedlings will require continued applications for a period of at least 4 to 5 years.

Locoweeds, Lupines, and Milk-vetches

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 to 2.75 L/acre at the full bloom stage.

Milkweed

Amitrol 240 - Apply 8.9 to 14.2 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in non-cropped areas and pastures in the early summer when all the shoots have emerged.

Glyphosate - When making preharvest applications, use 1.0 L/acre. For patch treatments, apply 4.86 L/acre in 10 gallons/acre (45 L/acre) water. Apply when most plants have reached the bud to bloom stage. Reduced results may occur on plants treated after full bloom as not all milkweed plants reach the required stage of growth at the same time. Repeat treatments may be required. Do not disturb plants for 10 days following treatment. Do not apply to plants covered with dust.

Narrow-leaf Hawk's-beard

2,4-DB - Apply to forage legume crops at recommended rates at the 2 to 4 leaf stage of narrow-leaf hawk's-beard, after legume growth in the fall has stopped.

2,4-D LV ester (500 g/L) - In fall stubble, apply 0.57 to 0.90 L/acre to fall rosettes.

Express Pack - In registered crops and summerfallow, apply at registered rates to spring seedlings less than 4 inches (10 cm) across or to fall rosettes.

Glyphosate - Prior to crop emergence, apply 0.51 to 0.77 L/acre in 5 to 10 gallons/acre (23 to 45 L/acre) water. Use the high rate if narrow-leaf hawk's-beard is between 3 and 6 inches (8 to 15 cm) in height.

Roundup Transorb - In Roundup Ready canola, apply 0.5 L/acre at the 0 to 6 leaf stage.

Pasture sage

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.2 L/acre to the foliage of actively growing plants.

Banvel II - In grass pastures, rangeland and non-crop land, apply Banvel II at 1.86 L/acre in 10 to 20 gallons/acre (45 to 90 L/acre) water to actively growing weeds.

Perennial Smartweed

Glyphosate - Apply 2.0 L/acre in 10 gallons/acre water. Apply when vines are a minimum of 8 inches (20 cm) tall, but before flowering.

Poplar

Glyphosate - As a non-selective spot treatment, apply 1.21 to 2.43 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in the summer through early fall when brush is actively growing.

Poverty Weed

Banvel II - As a spot treatment apply 1.86 L/acre Banvel II in 10 to 20 gallons/acre (45 to 90 L/acre) water when weed is actively growing. Banvel II at 0.61 L/acre will provide only top growth control.

Prairie Everlasting, Prairie Sage

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 L/acre to the foliage of actively growing plants in the early fall, and repeat in the spring.

Purple Loosestrife

(dryland situations only)

Roundup Transorb - Apply 2.43 L/acre in 30 to 60 gallons/acre (135 to 270 L/acre) water when purple loosestrife is actively growing and at or beyond the bloom stage. If using hand held equipment, apply a 1 to 2 percent solution until plants are wet. Use a 33 percent product solution if using a wiper applicator. Do not treat plants over open water. If possible, remove and destroy the flower heads before treatment to ensure prevention of seed set. For large monocultures of purple loosestrife, gradually work from the periphery inward over a number of years to allow competing vegetation to invade the treated area. Sprayed areas should be monitored for new seedlings to prevent re-infestation of purple loosestrife.

Red Bartsia

2,4-D amine or LV ester - Apply 0.57 L/acre of formulations containing 500 g/L 2,4-D in 10 gallons/acre (45 L/acre) water. On hayland, treat within 10 days after first cutting. Roadsides and pastures should be sprayed as soon as the red bartsia appears, usually in early July. Repeat treatment if necessary for later germination.

Roses

Escort - In pasture and rangeland, apply Escort at 0.012 kg/acre with Agral 90, Agsurf or Citowett Plus at 0.2 L per 100 L spray solution in 10 to 20 gallons/acre (45 to 90 L/acre) water. Apply between mid-June and mid-August after the brush has leafed out, but before the leaves begin to turn their fall colours.

Banvel II + 2,4-D amine or LV ester (500 g/L) - In grass pastures, rangeland and non-crop land, apply Banvel II at 1.48 L/acre with 2,4-D LV ester or amine at 1.78 L/acre to the foliage of actively growing brush in the spring or early summer.

Round-leaf Mallow

2,4-D amine or LV ester - In registered crops, apply 0.69 L/acre of 2,4-D (500 g/L formulations) when weeds are in the 2 to 4 leaf stage and when the crop is in the 4 leaf to flag leaf stage.

Dichlorprop + 2,4-D - In registered crops, apply 0.71 L/acre when weeds are in the 2 to 4 leaf stage and when the crop is in the 4 leaf to flag leaf stage.

Liberty - In registered crops, apply 1.1 L/acre to plants in 1 to 4 leaf stage.

Refine Extra - In registered crops, apply 0.008 kg/acre when round-leaved mallow is in the 2 to 6 leaf stage. Add Agral 90, Agsurf, Citowett Plus or Companion at 0.2 L per 100 L of spray solution.

Roundup Transorb - In Roundup ready canola apply split applications at 0.5 L/acre in the 0 to 6 leaf stage.

Saskatoon

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 L/acre to the foliage of actively growing brush.

Scentless Chamomile

Ally plus 2,4-D - Apply 0.003 kg/acre Ally plus 0.34 to 0.45 L/acre 2,4-D LV ester or amine (500 g/L formulations) in 10 gallons/acre (45 L/acre) water for control of scentless chamomile in wheat, barley, and creeping red fescue. Add Agral 90, Agsurf, Citowett Plus, Companion, or Super Spreader Sticker at 0.2 L per 100 L of spray solution.

Banvel II - Apply 0.51 L/acre Banvel II in 10 to 20 gallons/acre (45 to 90 L/acre) water to actively growing weeds for top growth control.

Buctril M - Apply 0.405 L/acre Buctril M when scentless chamomile is in the 2 to 4 leaf stage.

Curtail M - In registered crops, apply 0.81 L/acre in 10 gallons/acre (45 L/acre) water when scentless chamomile is actively growing and in the 2 to 4 leaf stage.

Escort - In pastures, rangeland and rough turf, apply 8 g / acre in 10 to 20 gallons / acre (45 to 90 L / acre) of water to actively growing plants of less than 4 inches (10 cm) tall. Add Agral 90, Agsurf, or Citowett Plus at 0.2 L per 100 L of spray solution.

Liberty - In registered crops, apply 1.1 L/acre to plants up to 4 inches (10 cm) in height.

Lontrel - In registered crops, apply 0.23 L/acre in 10 gallons/acre (45 L/acre) water when scentless chamomile is actively growing and in the 2 to 4 leaf stage.

Prevail - In registered crops, apply at a rate of 20 acres per case in 10 gallons/acre (45 L/acre) water when scentless chamomile is actively growing and in the 2 to 4 leaf stage.

Refine Extra - Apply 0.008 kg/acre in 10 gallons/acre (45 L/acre) water to actively growing seedlings for suppression. Add Agral 90, Agsurf, Citowett Plus or Companion at 0.2 L per 100 L of spray solution.

Stinging Nettle

2,4-D amine - Apply 0.91 to 1.82 L/acre of formulations containing 500 g/L 2,4-D amine.

In registered crops, apply at 20 acre/case rate when scentless chamomile is actively growing and in the 2-4 leaf stage.

Stork's Bill

Linuron - Apply with MCPA amine in registered crops at registered rates to stork's-bill in the 2 to 4 leaf stage.

Ally Toss-N-Go - Apply with 2,4-D or MCPA amine or LV ester in registered crops at registered rates to stork's-bill in the 2 to 4 leaf stage.

Attain - Apply at a rate of 40 acres per case to registered crops when stork's-bill is in the 2 to 4 leaf stage.

Dichlorprop + 2,4-D - Apply at 0.71 L/acre to registered crops when stork's-bill is in the 2 to 4 leaf stage.

Liberty - in registered crops apply 1.35 L/acre to plants in 1 to 3 leaf stage.

Roundup Transorb - in Roundup Ready canola, apply 0.5 L/acre in the 0 to 6 leaf stage.

Toadflax

Ally plus 2,4-D - Apply 0.002 to 0.003 kg/acre Ally plus 0.34 to 0.45 L/acre 2,4-D LV ester or amine (500 g/L formulations) in 10 gallons/acre (45 L/acre) water for toadflax suppression in wheat, barley, and creeping red fescue. Add Agral 90, Agsurf, Citowett Plus, Companion, or Super Spreader Sticker at 0.2 L per 100 L of spray solution.

Amitrol 240 - Apply 8.9 to 14.2 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in non-cropped areas and pastures when the weed is in the advanced rosette to prebud stage.

Dichlorprop + 2,4-D - Apply 0.71 L/acre in 10 to 18 gallons/acre (45 to 80 L/acre) water in wheat or barley for toadflax suppression. Apply when majority of toadflax is no taller than 6 inches (15 cm). The use of Dichlorprop + 2,4-D for suppression of toadflax in wheat or barley should be part of a long-term planned approach for toadflax control, which includes spring and fall tillage, fall patch spraying, summerfallow or chemical fallow.

Glyphosate - Apply 2.83 to 4.86 L/acre when most plants have reached the early bud stage of growth. Allow 7 more days after application before tillage. A rate of 1.0 L/acre may be used with preharvest applications or when controlling in summerfallow situations.

Refine Extra - In registered crops, apply 0.008 kg/acre in 10 gallons/acre (45 L/acre) water for suppression of toadflax. Apply when toadflax is less than 15 cm (6 inches) in height. Add Agral 90, Agsurf, Citowett Plus or Companion at 0.2 L per 100 L spray solution.

Western Snowberry (Buckbrush)

Banvel II plus 2,4-D LV ester (500 g/L) - Apply 1.48 L/acre Banvel II tank mixed with 1.82 L/acre 2,4-D LV Ester in 20 gallons/acre (90 L/acre) water in spring or early summer after the leaves are fully expanded.

2,4-D amine or LV ester (500 g/L) - Apply 1.82 L/acre 2,4-D amine or LV ester in a minimum of 20 gallons/acre (90 L/acre) water in spring or early summer. Retreatment may be necessary the following year.

Escort - Apply 0.010 kg/acre in 10 to 20 gallons/acre (45 to 90 L/acre) water between mid-June and mid-August after the brush has leafed out, but before the leaves turn their fall colours.

White Cockle

Mecoprop - Apply 2.2L/acre in 18 gallons water/acre (*80 L/acre) for top growth control of established plants. Will also control seedlings. Apply to registered crops only.

2,4-DB - Apply Embutox 625 at 1.1 L/acre or Caliber 400 at 1.7 L/acre or Cobutox 600 at 1.1 L/acre for top growth control to registered crops only.

Wolf Willow (Silverwillow)

Banvel II + 2,4-D amine or LV ester (500 g/L) - In grass pastures with no legumes, apply Banvel II at 2.1 L per 1000 L of water with 2,4-D LV ester or amine at 4.0 L per 1000 L of water to the foliage of actively growing brush in the spring or early summer and wet the foliage until the point of runoff.

Wild Tomato

2,4-D or MCPA amine or ester (500 g/L) - Apply 0.34 to 0.45 L/acre to registered crops up to the 8 leaf stage of wild tomato.

Buctril M - Apply 0.40 L/acre to registered crops from the 1 to 6 leaf stage of wild tomato.

Willows

2,4-D LV ester - In grass pastures and non-crop land, apply 2,4-D LV ester (500 g/L) at 1.78 L/acre to the foliage of actively growing brush.

Glyphosate - As a non-selective spot treatment, apply 1.21 to 2.43 L/acre in 10 to 30 gallons/acre (45 to 135 L/acre) water in the summer through early fall when brush is actively growing.

Soil Residual Herbicides

When applied at recommended rates in a crop, most herbicide residues will disappear within a few weeks after application and impose no restriction on cropping options the next year. However, some herbicide residues do not degrade quickly, and can persist in the soil for months or years following application, thereby restricting the crops that can be grown in rotation. Herbicide residues in the soil are deactivated in various ways including:

- Break down by chemical reactions,
- Break down by soil microbes,
- Escape to the atmosphere as a gas (volatilization),
- Break down by light (photodegradation),
- Leaching,
- Binding to soil particles.

Herbicides often disappear from the environment by more than one of these mechanisms. Many herbicides considered to be non-residual are bound temporarily to soil particles while they are broken down gradually by either soil microbes or chemical reactions. The binding action insures that the herbicide is not available to the crop in quantities that will cause damage.

As a general rule, breakdown processes are favoured by warm, moist soil conditions. During the winter, when the ground is frozen, and in the summer when the soil is dry, herbicide degradation is minimal. The residual activity of certain herbicides is also affected by soil organic matter and soil pH. These soil factors are seldom uniform across a field. Herbicide carryover, especially that of soil active herbicides, is aggravated by low levels of organic matter and is more likely to occur on eroded hilltops than in other parts of a field. Soil pH levels can vary significantly even within a field and pH can affect the speed of chemical reactions. The risk of herbicide carryover will also be greater in sprayer overlaps that are most common around headlands and slough margins.

Growers should be aware of the residual properties before applying any herbicide if they are to avoid cropping restrictions in following years. Knowledge of the limitations associated with herbicides that leave a soil residue, along with an accurate record of application (i.e. rates, locations) will serve to minimize rotational problems

Herbicides that leave a soil residue and are of particular concern in western Canada are:

2,4-D/MCPA - Phenoxy herbicides are lost from the soil primarily through biological degradation. This mode of breakdown is favoured by warm moist soil conditions. When applied at recommended rates in a crop 2,4-D or MCPA disappear within a few weeks after application and impose no restriction on recropping options the next year.

However, 2,4-D or MCPA should not be applied in the spring either pre-emergence or prior to the seeding of a broad-leaf crop. Safe recropping intervals for broad-leaved crops cannot be given.

ACCENT - Accent residue in the soil is likely degraded through microbial activity. This mode of breakdown is favoured by warm moist soil conditions. Corn and spring cereals may be seeded the year following Accent application. For all other crops, a field bioassay* is recommended before planting.

ACCORD - Accord residue in the soil is broken down primarily through microbial degradation. This mode of breakdown is favoured by warm moist soil conditions. Wheat (including durum), barley, canola, field pea, and sunflower may be grown the year after treatment. Flax and lentil may be grown the second year after application on soil with high organic matter. In soil with low organic matter, flax and lentil crops should be delayed until the third year after application. Do not apply Accord on land where potatoes and vegetables are expected to be grown. Only spring wheat (including durum) may be reseeded in the same year of application. Perform a field bioassay* in the year before growing any crop not listed.

ADVANCE 10G (granular) - See Trifluralin

ALLY - Ally breaks down from treated soils through both chemical reaction and by microbial degradation. Breakdown is most rapid under conditions of moist soil, warm temperatures and low soil pH. Several crops including forage legumes, mustard, canola, flax, canaryseed, field pea and lentil are sensitive to Ally residues in the soil the year following application. Oat is somewhat sensitive at a soil pH of 7.0-7.9 on brown and dark brown soils. Use of Ally should be limited to soils with a pH of less than 7.9. Refer to the Ally section or product label for recropping details. Recropping intervals may be reduced if a successful field bioassay* has been completed.

AMBER - Amber residues in the soil break down by both chemical reaction and microbial degradation. Breakdown is most rapid under conditions of moist soil, warm temperatures and low soil pH. Crops such as canola, flax, canaryseed, field pea and lentil are highly sensitive to low levels of Amber residue in the soil. Refer to the Amber section or product label for recropping details. In soils with a pH greater than 7.5, crops other than wheat (including durum), barley and oat cannot be grown in rotation until a field bioassay* indicates that it is safe to do so. Hard Red Spring, Canada Prairie Spring, and Extra Strong wheat have no restrictions for reseeding at any pH level.

ANTHEM - See Sundance, page 195.

ASSERT 300-SC - Assert residues are broken down primarily by microbial degradation. This process is favoured by warm, moist soil conditions. Rotation to various crops the year following the application of Assert is dependent upon soil zone (Saskatchewan). In the black and grey wooded soil zones, wheat (spring, durum), barley, sunflower, flax, pea and canola can be seeded the year following application. In the brown and dark brown soil zones, wheat (spring, durum), barley and sunflower can be seeded the year following application. Wheat (spring, durum), barley, sunflower, flax, peas, canola, oat and canaryseed may be seeded in all soil zones 2 years after the application of Assert. To assess potential damage to crops not listed, conduct a field bioassay* in the year prior to growing the crop. Lentils are particularly sensitive to Assert residues in the soil. The additive effect of soil residues from the use of persistent sulfonylurea herbicides and Assert herbicide on the same land has not been determined. Crop rotation guidelines and minimum rotation intervals are not known and injury to rotational crops other than spring wheat (not including durum) may occur. Where Assert has been used on land previously treated with Accent, Ally, Amber, Muster, Prism, or Unity herbicides, plant only wheat (not including durum) until a field bioassay* demonstrates that other crops can be grown.

ATRAZINE - Atrazine is broken down in the soil through chemical reactions at low to normal pH. Microbial degradation is a minor contributor to atrazine breakdown. Both methods are maximized under warm, moist soil conditions. Breakdown is reduced at pH greater than 7.5 and under dry soil conditions. All crops except corn and triazine tolerant canola may be injured if seeded in the year of application. At annual weed rates (0.85-1.25 L/ac of 480 liquid or 0.44-0.69 kg/ac of water dispersible granules) the risk of injury is minimal to most rotational crops. Flax, pea, and fababean have some tolerance to atrazine residues and are usually not affected by residues from low rates applied the previous year. Very sensitive crops, such as oat, may be affected 2 or more years after application.

AVADEX BW (liquid and granular) - Avadex BW residue is lost from the soil primarily through microbial degradation. Volatilization is a secondary source of loss from the surface of the soil. Under normal conditions, Avadex BW will not leave a residue in the soil that would affect rotational crops. Under dry conditions, however, some Avadex BW may carryover. Therefore, oat should not be sown the year following application. Granular formulations may persist longer than liquid formulations.

ATTAIN - Fields previously treated with Attain can be seeded the following year to wheat, barley, oat, rye, forage grasses, peas, lentils, flax, canola, or mustard. Do not seed crops other than those listed above for at least 2 years following treatment.

BANVEL II - Banvel II is broken down primarily through microbial activity. At recommended rates of application in cereal crops (up to 0.117 L/acre), Banvel II will not leave a harmful residue in the soil. Banvel II used for perennial weed control in summer fallow and in stubble after harvest may result in residue carryover that will damage the following crop. Cereals, corn (field and sweet), soybeans, and white beans may be grown the year following a fallow application of up to 0.41 L/acre. These crops plus canola may be grown following a fallow application of up to 0 20 L/acre. An increased risk of crop injury may occur if a fallow application is made after September 1 or if soil moisture levels are extremely low following application.

BONANZA 400 or 10G (liquid or granular) - See Trifluralin

CURTAIL M - Soil residues of Curtail M are degraded primarily by microbial activity. Fields previously treated with Curtail M can be seeded to wheat, oat, barley, corn, rye, flax, canola, or mustard. Do not seed to crops other than those listed the year after treatment. There are no cropping restrictions thereafter. For updated information concerning the seeding of specialty crops call 1-800-667-3852.

EDGE - Edge residue in treated soil is broken down primarily by soil microbes during the growing season, but residues on the surface are also lost through volatilization and photodegradation. Microbial breakdown is favoured by warm, moist soil conditions, and carryover will be higher than expected under drought conditions. The risk of injury increases with conditions that reduce crop vigour, such as seedling disease, cold soil, deep seeding, high salt concentrations, soil compaction, water logged soils, drought, or low quality seed. Under typical conditions, Edge should not harm vigorous rotational crops if applied as directed. As a precaution very sensitive crops such as oat, canaryseed or small seeded grasses, such as timothy and creeping red fescue, should not be grown in rotation to an Edge treated crop. Wheat should also be avoided if the Edge application has been preceded by a high rate of trifluralin or another Edge treatment. Do not direct seed (zero till) a crop other than an oilseed or pulse crop into standing stubble following an application of Edge in the previous season. Granular formulations may persist longer than powder formulations.

FORTRESS - Fortress residue is broken down primarily by soil microbes during the growing season, but residues on the surface are also lost through volatilization and photodegradation. Microbial breakdown is favoured by warm, moist soil conditions, and carryover will be higher than expected under drought conditions. Under normal conditions, Fortress residues will not affect most crops the season after application. However, under dry conditions higher than normal levels of Fortress may exist. Therefore, oat, small seeded forage grasses and canaryseed should not be grown in rotation following a Fortress treated crop.

LONTREL - Lontrel residue is degraded exclusively by microbial action. Fields previously treated with Lontrel can be seeded to wheat, oat, barley, rye, forage grasses, flax, canola, or mustard. Do not seed to crops other than those listed the year after treatment. There are no cropping restrictions thereafter. For updated information concerning the seeding of specialty crops call 1-800-667-3852.

MUSTER - Muster residue in the soil is degraded primarily through microbial activity. Wheat, barley, oat, and flax may be seeded the year after application. Canola, lentils, field peas, fababeans, tame mustard, alfalfa, canaryseed, dry bean, fescue, and red clover may be grown in the second year after application.

ODYSSEY - Odyssey contains the same active ingredient as Pursuit (imazethapyr) in combination with another compound (imazamox) from the same chemical family. Both are lost primarily through microbial degradation, but the Pursuit active is the more persistent of the two compounds. Both compounds have the characteristic of extended carryover under acidic soil conditions. At recommended application rates less than 1/3 of the imazethapyr active is applied with Odyssey than with Pursuit. Under normal growing and soil conditions, spring wheat (including durum), lentils, alfalfa, Smart canola varieties and field peas can be grown in the year following an application of Odyssey. A field bioassay* should be conducted the year before growing any other crop. For current information contact 1-800-387-5073.

POAST FLAXMAX - See Curtail M.

PREVAIL - See Curtail M.

PRISM - Prism residue in the soil is degraded primarily through microbial activity. This mode of breakdown is favoured by warm moist soil conditions. Crops that may be seeded one year after application of Prism are corn, potato, spring barley, canola, soybeans, white beans, red clover, and sorghum. A field bioassay* should be conducted the year before growing any other crop.

PURSUIT - The loss of Pursuit from soil is primarily through microbial degradation. This process is favoured under warm, moist conditions. Pursuit persists longer in acidic soil than normal pH soil. Breakdown stops under flooded conditions. Under normal growing and soil conditions, barley, spring wheat (not durum), lentils, alfalfa, Smart canola and field peas can be grown in the black and grey wooded soil zones the year following a Pursuit application. Other crops should not be grown in rotation until a field bioassay* indicates that it is safe to do so.

RIVAL (liquid and granular) - See Trifluralin.

SENCOR - Metibuzin is broken down in the soil primarily through microbial degradation. This process is maximized under warm, moist soil conditions. Breakdown is very rapid under flooded soil conditions. Pre-plant incorporated treatments at higher rates may carry over and affect sensitive crops the following year including canola (non-TTC), sunflowers and vegetable crops. Fall seeded crops may be injured in the same year as pre-plant or post-emergent applications.

SUNDANCE- Sulfosulfuron, the active ingredient in Sundance/Anthem, is broken down by microbial activity and chemical reactions. As a result, the cropping rotation restrictions for fields treated with Sundance or Anthem is determined by soil organic matter and pH. Fields with organic matter greater than 4 percent can be rotated to wheat (including durum), canola, barley, peas and flax while fields with less than 4 percent organic matter and a pH greater than 7.0 should be rotated to either wheat (including durum) or SMART canola the year after treatment. Do not plant any other crops for at least 22 months after application. A field bioassay* must be conducted the year prior to growing the crop of interest to confirm crop safety.

TREFLAN (liquid or granular) - See Trifluralin.

TRIFLURALIN (liquid or granular) - Trifluralin residue is broken down primarily by soil microbes during the growing season, but residues on the surface are also lost through volatilization and photodegradation. Microbial breakdown is favoured by warm, moist soil conditions, and carryover will be higher than expected under drought conditions. The risk of injury increases with conditions that reduce crop vigour, such as seedling disease, cold soil, deep seeding, high salt concentration, soil compaction, water logged soil, drought, or low-quality seed. Under typical conditions, trifluralin should not harm vigorous rotational crops if applied as directed. As a precaution very sensitive crops such as oat, canaryseed or small seeded grasses, such as timothy and creeping red fescue, should not be grown in rotation to a trifluralin treated crop. Wheat should also be avoided if the trifluralin application has been preceded by a high rate of trifluralin or Edge treatment. Do not direct seed (zero till) a crop other than an oilseed or pulse crop into standing stubble following an application of trifluralin in the previous season. To reduce the risk of wheat injury, avoid deep seeding, loose seedbeds, and seeding into cold ground. Barley is more tolerant to trifluralin residues than wheat. Do not plant oat, canaryseed or small seeded grasses for 24 months after a spring application or 30 months after a fall application of trifluralin. Do not plant fall rye for 6 months following a spring application or 12 months after a fall application. Carryover can be higher with granular formulations.

UNITY - (Brown and dark brown soils of Saskatchewan only) Unity residue breaks down by both chemical reaction and microbial degradation. Breakdown is most rapid under conditions of moist soil, warm temperatures and low soil pH. Crops other than wheat (spring, durum and CPS) are highly sensitive to low levels of Unity residue in the soil. Refer to the Unity section or product label for recropping details. In soils with a pH greater than 7.5, crops other than spring wheat (including durum), barley and oat cannot be grown in rotation until a successful bioassay* is performed. Hard Red Spring, Canada Prairie Spring, and Canada Extra Strong wheat have no restrictions for reseeding at any pH level. Refer to the Unity section or product label for recropping details.

*Note: A field bioassay means growing to maturity a test strip of the crop(s) intended for production the following year. A strip of the same crop grown in an untreated area nearby is helpful as a reference.

Effect of Rainfall on Herbicide Efficacy

Required Interval	Product
15 minutes	Reglone/Reglone Pro
30 minutes	Horizon
1 hour	Achieve, Achieve Extra Gold, Assure II, Gramoxone, Hoe-Grass, Hoe-Grass II, Platinum, Poast Ultra, Puma, Puma^{120} Super, Puma Super,Select
2 hours	2,4-D LV Ester, Ally+2,4-D LV Ester, Atrazine (postemergent applications), Bladex Liquid (postemergent applications), Champion Plus, Fusilade II, Fusion, Laser DF, MCPA Ester, Triumph Plus, Venture
4 hours	Accent, Ally + 2,4-D Amine, Champion Extra, 2,4-D Amine, Harmony Total, Liberty, MCPA Amine, Muster, Muster Gold, Prism, Refine Extra, Stampede EDF
6 hours	Accord, Assert, Avenge, Curtail M, Express Pack, Flaxmax Ultra, Lexone DF, MCPA-K, MCPA Sodium Salt, Prevail, Rustler, Sencor 75DF, Sencor 500
8 hours	Basagran, Laddock
No specific recommendation*	Afolan F, Amitrol 240, Attain, Banvel II, Buctril M, Caliber, Cobutox, Compitox, Dichlorprop-D, DyVel, DyVel DS, Embutox, Escort, Estaprop, Glyphos, Gramoxone PDQ, Lontrel, Lorox DF, Mecoprop, Odyssey, Pardner, Pursuit, Roundup Dry, Roundup Original, Roundup Transorb, Touchdown, Target, Thumper, Tropotox Plus, Turboprop, Unity, Vantage, Vantage Plus, Victor

* The products listed make no specific time recommendation on the label. The required rainfree period could be up to 8 hours. See the product page in the guide or consult the product label.

Note: The term "Rainfastness" refers to the time needed between application and rainfall to avoid significant reduction in efficacy. Rainfall shortly after application of most postemergent herbicides may reduce weed control. Effect will vary with product, the interval between spraying and rainfall and the intensity and duration of the rainfall. These guidelines are based on label information. Use the longest time interval on the component products when considering tank mixes.

Plant Disease Control

Integrated Plant Disease Management

Cereals

Cereal leaf diseases continue to hurt growers on two fronts: yield and quality. The fact sheet *Managing Cereal Leaf Diseases* outlines the best management practices to help growers manage cereal diseases and minimize the threat they pose to yields and quality. The following management practices are recommended for effective control of leaf diseases in all cereal crops, especially high-value barley and both spring and winter wheat.

Scouting: Scout fields at and following flag leaf emergence to check for disease levels. Healthy flag and upper leaves are critical, since more than 50% of grain filling is contributed by upper leaves.

Crop Rotation: Rotate crops (wheat/oilseeds/barley/pulse, for example) to reduce the build-up of disease inoculum in crop residue. If at all possible, do not follow wheat with wheat or barley with barley. When a short rotation is absolutely necessary, seed in the second year a variety that is more resistant to an anticipated disease problem.

Clean Seed: Use certified seed and/or seed that has been treated with an appropriate fungicide to reduce the possibility of introducing seed-borne inoculum into a field.

Seed Treatments: Seed treatments together with quality seed help emerging crops by controlling most seed-borne disease and allowing the crop to get a good start (quicker, more uniform plant emergence and better seedling vigour). Seed treatments protect young plants against seedling diseases but do not prevent later infection from soil or stubble borne cereal leaf diseases.

Resistant Varieties: Provincial crop/seed guides provide a comprehensive listing of the performance of adapted cultivars, including their resistance status to specific diseases.

Cropping Practices: Begin to scout fields prior to flag leaf emergence and continue to monitor crops for symptoms of leaf diseases appearing on the lower leaves.

Foliar Fungicides: Foliar fungicides applied at the proper time in accordance with manufacturer's recommendations can control cereal leaf diseases and help to attain target yields.

Spraying Practices: For maximum effectiveness, foliar fungicides should be applied preventively (when infection levels are extremely low). Good spray coverage with minimal drift is essential. Ideally, the best time to spray is when the wind is calm; humidity is above 60 percent; and air temperature is between 10 and 25 degrees C.

Fusarium Head Blight

Fusarium head blight (FHB) may reduce wheat yields up to 30 per cent. More important is the effect on grain quality and food safety. In Manitoba, FHB occurs throughout all crop regions and will damage wheat crops whenever environment conditions favour the disease. In Saskatchewan, FHB is established in the southeast but has occurred in some areas throughout the province.

For Fusarium head blight (FHB) to occur, three requirements must be met: the disease causing fungus must be present, a susceptible host grown, and environmental conditions favorable for infection and disease development. If any one of these factors is missing disease cannot occur. However, the severity of disease in the field is a result of the interaction of the above factors.

Field Management to Prevent Recurrence

Weather patterns are by far the greatest factor in the recurrence of fusarium head blight. The disease is most likely to develop when the plants are flowering, temperatures range from 25 to 30 degrees C and moisture is continuous for 48 to 60 hours. If conditions remain warm and moist, the pathogen can continue to sporulate and spread to other kernels or heads. Under these optimum conditions, crop management has little impact on fusarium outbreaks.

Under average conditions, fusarium can be effectively controlled through normal disease management practices. Like other plant diseases where the disease survives on cereal stubble, crop rotation is the most effective control tool.

Crop Rotation and Selection

A break of at least one year – preferably two years – is advised between cereal, grass and corn production.

Regardless of the rotation, producers should consider planting cereals that are less susceptible to Fusarium head blight. Results from previous years show that durum wheat is more susceptible than hard red spring wheat varieties. Barley is more tolerant than wheat, and oats are considerably more tolerant than either wheat or barley.

Avoid planting the more susceptible types of wheat in high risk areas such as the southern part of the Red River Valley and southeastern Saskatchewan. Planting two or more varieties of wheat will spread out flowering times and reduce the risk of infection. Planting dates should be staggered within the recommended planting period to vary the flowering dates and reduce disease severity.

Susceptible crops should definitely not be planted on infected corn stubble. Corn trash is slower to decompose than cereal trash, and acts as a source of infection for a much longer time period. In fields of wheat on wheat stubble, the incidence was about one and a half times higher than in fields of wheat planted into pulse crop residue.

A forecast risk of occurrence of Fusarium head blight in wheat during the growing season was conducted by Manitoba Agriculture and Food with support from Bayer Inc. in 1999. This information appears on the Agrometeorological Centre of Excellence webpage http://www.gov.mb.ca/agriculture/ace.

Potatoes

One of the major threats to Manitoba's and Saskatchewan's potato industry is the fungal disease late blight. At present, there are no fungicides registered for use on potatoes that are capable of eradicating the fungus once it is present. As a result, producers are forced to adopt preventive management to control this disease. One of the main components of this strategy is the application of fungicides at specified spray intervals. This interval varies with the type of fungicide used. Shortening or lengthening of this interval should be based on current weather conditions and the status of the disease in the crop.

Manitoba Agriculture and Food, in association with Geotech Environmental Services and Saskatchewan Agriculture and Food, in association with the Saskatchewan Seed Potato Growers Association, have initiated a weather monitoring program in the potato producing regions. The purpose of this program is to predict when environmental conditions are most conducive to disease development and issue warnings based on those predictions. Accurate weather monitoring and scouting techniques are very important for achieving the most effective use of fungicides. Combining precise weather monitoring with spray interval scheduling may lower input costs for the farmer and lead to a more productive, higher quality crop. These weather monitoring systems monitor key environmental variables, such as relative humidity, temperature, leaf wetness and precipitation. Risk forecast maps and interpretation appear on the Agrometeorological Centre of Excellence homepage http://www.gov.mb.ca/agriculture/ace in Manitoba and www.agr.gov.sk.ca in Saskatchewan.

The following management practices are recommended for effective control of late blight in potato crops.

Scouting: To effectively schedule preventative fungicide applications and eliminate unnecessary fungicide use, local weather forecasts should be used to identify conditions conducive to disease development. Scout fields to identify hot spots and other sources of disease when conditions are favourable.

Crop Varieties and Resistant Cultivars: Select varieties with resistance to late blight wherever possible. Where practical, the use of short season varieties may help reduce the period of use for fungicides.

Healthy Seed: Obtain seed from sources with effective disease management practices. The use of certified seed is recommended. Grade seed carefully while cutting and discard suspicious looking tubers and seed pieces.

Sanitation and Cull Clean-up: Follow a program of sanitation for storage facilities and equipment to eliminate sources of the disease. Avoid leaving tubers, including debris or slivers from seed cutting, in cull piles for any length of time. Avoid uncovered cull piles during the growing season.

Cultural Practices and Rotation: Use proper cultural practices including: rotate potato crops with non-late blight hosts; use proper hilling to reduce infection in tubers; increase spacings of plants to reduce canopy density; manage irrigation use to avoid increasing disease risk during prolonged periods of wetness; identify and destroy hot spots of infected fields; control weed hosts and remove and destroy volunteer potatoes.

Canola

For the past 25 years, sclerotinia stem rot has been one of the two prominent diseases affecting canola in Manitoba and Saskatchewan. An important regulation of disease development is environmental conditions. The disease is much more widespread and severe during wet years.

Fungicide applications are an important element in controlling the development and spread of sclerotinia. Fungicide spray decisions are based on soil moisture, weather conditions, crop stage and density, and the history of disease in your area.

The sclerotinia sclerotia require moist soil conditions for up to 10 days for germination to occur and the spore-bearing structures (apothecia) to form. Usually these conditions do not occur until the crop canopy closes. The spores released from the apothecia utilize the canola petals as a food source and fall into the canola canopy where they infect individual plants. Lesions form up and down the stem, wilting leaves and eventually killing the plant. Producers should check their fields prior to the flowering stage for the apothecia. Fungicide should be applied between the 20 to 50 per cent flower stage to protect the petals from being colonized by the spores.

A forecast of the risk of occurrence of sclerotinia of canola during the blossom period was conducted by Manitoba Agriculture and Food with support from DuPont Canada Inc. in 1999. Risk maps and interpretation for Manitoba and Saskatchewan are produced twice weekly from June 15 to July 31. This information appears on the Agrometeorological Centre of Excellence webpage http://www.gov.mb.ca/agriculture/ace.

Table 1. Foliar Applied Fungicides in Field Crops

FUNGICIDES	Page	Alfalfa (for seed only)	Barley	Beans (Field)	Canola	Lentils, Chickpeas	Oats	Peas (Field)	Potatoes*	Wheat	Anthracnose, Ascochyta (Lentils), Ascochyta (chickpeas, peas)	Bacterial Blight (Beans)	Blackleg (Canola)	Botrytis/Gray Mould (Beans, Alfalfa)	Botrytis/Gray Mould (Potatoes)	Crown Rust (Oats)	Downy Mildew, Anthracnose (Beans)	Early Blight, Late Blight (Potatoes)	Leaf Rust, Stem Rust, Net Blotch, Scald (Barley)	Leaf Rust, Stem Rust (Wheat)	Powdery Mildew (Wheat, Barley, Peas)	Sclerotinia	Septoria (Wheat, Barley, Oats)	Tan Spot (Wheat)	Fusarium Head Blight (Wheat)	Alternaria Blackspot (Canola)
Acrobat MZ	229								X									•								
Benlate	234	X		X	X									•								•				
Bravo 500	235					X		X	X	X	•				•			•					•[2]	•	•[7]	
Bravo/Ridomil	236								X									•								
Guardsman Copper Oxychloride 50, Clean Crop Copper Spray	239								X									•								
Clean Crop Copper 53W, Champion WP	239			X					X			•					•[3]	•								
Dithane DG, Dithane DG Rainshield NT	244								X	X								•		•[1]			•[2]	•		
Kocide 101, Kocide DF	239			X[8]					X			•						•								
Kumulus DF	250							X													•[5]					
Manzate 200-DF	244								X									•								
Polyram 16D	253								X									•								
Polyram DF	253								X									•								
Ridomil MZ 72 WP, Ridomil Gold	258								X									•								
Ronilan EG	260			X	X																	•				
Rovral Flo	261				X																	•				•[7]
Senator 70 WP	263			X																		•				
Tattoo C	265								X									•[6]								
Tilt	267		X		X		X			X			•			•			•	•	•[4]		•	•		

[1] leaf rust only
[2] wheat only
[3] Clean Crop Copper 53W only
[4] wheat, barley only
[5] peas only
[6] late blight only
[7] suppression only
[8] Kocide 101 only

*All products approved for use in potatoes by Midwest Foods Products Inc.

Table 2. Seed Treatments in Field Crops

		CROP DISEASES/INSECTS CONTROLLED																																	
		POTATO SEED PIECE						SEED AND SEEDLING ROTS/BLIGHTS														SMUTS CARRIED ON SEED							IN SEED		BLACK LEG	[illegible]	INSECTS		
FUNGICIDES	Page	Blackleg	Black Scurf (Rhizoctonia)	Common Scab	Seed Piece Decay	Storage Rot	Verticillium Wilt	Canola (Rapeseed)	Cereals	Chickpeas	Corn	Field Beans	Flax	Forage Legumes	Grasses	Lentils	Mustard	Peas	Soybeans	Sunflowers	Triticale	Barley - Covered	Barley - False Loose	Corn - Head Smut	Oats - Smut	Rye - Bunt	Rye - Stem Smut	Wheat - Bunt	Barley - Loose Smut	Wheat - Loose Smut	Canola (Rapeseed)	Canola (Rapeseed)	Wire Worms	Seed Corn Maggots	Flea Beetles
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[1] also controls leaf stripe in barley and early season powdery mildew in wheat.

[2] also seed-borne ascochyta.

[3] wheat, barley only.

[4] also seed-borne anthracnose.

[5] also controls downy mildew.

[6] for Foundation only.

*Products approved for use in potatoes by Midwest Food Products Inc.

Fungicide/Seed Treatment Directory

Acrobat MZ

Company:

Cyanamid Crop Protection

Formulation:

9 percent dimethomorph and 60 percent mancozeb formulated as a wettable powder. Container size - 10 kg.

Crops:

Potatoes.

Diseases Controlled:

Early and late blight.

Reduction of tuber blight.

Crop Stage:

Make the first application when the disease threatens or when the first visible signs of disease occur in the field or nearby. Apply every 5 to 7 days under high disease pressure or every 7 to 10 days under low disease pressure. Do not apply more than 3 times per season. It is recommended to apply this product alternately with a fungicide having a different mode of action. Under high level of late blight infection, apply after top kill to control tuber blight.

How it Works:

Acrobat has protectant, systemic and antisporulant activity. The active ingredient mancozeb is a dithiocarbamate fungicide with contact activity. The active ingredient dimethomorph penetrates into the leaf tissue and moves within the leaf.

Cost:

$32.85/acre

(1999 suggested retail price).

Rate:

Apply at 1.0 kg per acre.

Water Volume:

Use sufficient water to obtain adequate spray coverage.

Ground - 18 gallons/acre (80 L/acre).

Aerial - minimum 5 gallons/acre (20 L/acre).

Restrictions:

Rainfall: Do not apply when rain is expected within 2 - 3 hours. Apply to dry foliage.

Preharvest Interval: 14 days.

Recropping: Do not replant in treated area within 120 days of last application.

Environmental: Do not apply to terrain where there is a potential for surface runoff to enter aquatic systems. This product is highly toxic to aquatic organisms. Do not apply within 100 m of streams, ponds, rivers and lakes when applying by air and within 50 m when applying by ground.

Storage: Store under cool, dry conditions in secure, well ventilated buildings away from food or feed.

Resistance: Plant diseases can develop resistance when exposed to one type of product or even products of similar chemistry. Use cultural practices and fungicide rotation as well as early preventive fungicide applications. Consult the government Potato Specialist or Plant Disease Specialist for disease outbreak forecast and recommendations.

Hazard Rating:

Caution: Potential skin sensitizer.

Agrox D-L Plus/Agrox B-3/DLC

Company:

Norac Concepts Inc. (Agrox D-L Plus, Agrox B-3), United Agri Products (DLC)

Formulation:

Agrox D-L Plus and DLC - 15 percent captan plus 15 percent diazinon plus 25 percent lindane. Formulated as a seed treatment powder.

Agrox B-3 - 33.5 percent captan, 11 percent diazinon, and 16.6 percent lindane.

Container size: Agrox D-L Plus - 0.2 kg, 0.6 kg, Agrox B-3 - 2.0 kg, DLC - 0.05 kg, 0.5 kg.

Crops:

Corn, beans, soybeans, peas.

Diseases Controlled:

Seedling blight and seed rot.

Insects Controlled:

Wireworms and seed corn maggots.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient captan is a phthalimide fungicide with contact activity. The diazinon component is an organophosphate insecticide with contact and stomach activity. The lindane component is an organochlorine insecticide with contact and stomach activity.

Cost:

$29.70 for 600 g. Cost to treat 25 kg of seed - $2.47 (Agrox D-L Plus)

$82.46 for 2 kg. Cost to treat 25 kg of seed (dry application) - $3.30 (Agrox B-3)

Prices not available for DLC.

(1999 suggested retail prices).

Rate:

Agrox D-L Plus - 0.05 kg per 25 kg of seed (one 0.6 kg container treats 300 kg, one 0.2 kg container treats 100 kg).

Agrox B-3 - Dry application: 0.08 kg (0.085 for corn) per 25 kg of seed. Slurry machines: adjust to apply 0.31 L (0.315 for corn) of slurry per 25 kg of seed and use 0.25 kg of seed treatment per L of water. Handmixing: 0.084 kg seed treatment per 0.5 L of water per 25 kg of seed.

DLC - One 0.5 kg tube treats 227 kg of seed, one 0.05 kg pouch treats 22.7 kg.

Water Volume:

See Rate.

Registered Mixes:

Do not use Agrox D-L Plus or DLC on seed already treated with an insecticide (other than methoxychlor or malathion).

Do not use Agrox B-3 on seed already treated with an insecticide.

Restrictions:

Use: Use Agrox D-L Plus or DLC only on seed previously treated with Captan or Thiram.

Storage: Store in a cool, dry place. Treated seed must be labelled. Label unplanted treated seed as follows: "POISONOUS TO MAN AND ANIMALS. This seed has been treated with Diazinon and Lindane for the control of insects, and Captan for disease control. Do not use for food or feed purposes. Do not sell to oil mills."

Precautions:

Do not mix with unprotected hands.

Hazard Rating:

Danger Poison

Apron FL

Company:

Gustafson

Formulation:

317 g/L metalaxyl formulated as a liquid seed treatment. Container size - 3.78 L.

Crops:

Alfalfa, beans, chickpeas, canola, clover, corn, grasses, low tannin lentils, peas, sainfoin, soybeans, sunflowers, and vetch. Crops for export only - wheat, barley, oats, rye, bird's-foot trefoil and sorghum.

Diseases Controlled:

Seed rots and seedling blights caused by *Pythium* spp. fungi, early season *Phytopthora* of soybeans, and downy mildew of sunflowers. Also (for export purposes only) downy mildew of peas, corn, and sorghum.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient metalaxyl is an acylalanine fungicide with systemic activity.

Cost:

$172.00/L (1999 suggested retail price.)

Rates and Water Volumes:

Rates for crop processed in Canada:

CROP	APRON FL (L per 100 kg seed treated)	WATER (L required to make up a total volume of 0.5 L)	KG SEED TREATED PER JUG
Chickpeas*, dry peas*	0.016 - 0.11	0.484 - 0.39	23,625 - 3,436
Canola (rapeseed)*, processing peas	0.032 - 0.11	0.468 - 0.39	11,812 - 3,436
Sainfoin, vetch, alfalfa, beans, clover, corn	0.046 - 0.11	0.454 - 0.39	8,217 - 3,436
Grasses (forage), soybeans	0.046 - 0.093	0.454 - 0.407	8,217 - 4,064
Grasses (turf)	0.093	0.407	4,064
Sunflowers (high rate is for downy mildew control)	0.11 - 0.189	0.39 - 0.311	3,436 - 2,000
Low tannin lentils	0.016	0.484	23,625

*low rate gives good Pythium protection for 2 to 3 weeks.

Rates for crop to be exported:

CROP	APRON FL (L per 100 kg seed treated)	WATER (L required to make up a total volume of 0.5 - 0.62 L)	KG SEED TREATED PER JUG
Corn (downy mildew)	0.189 - 0.62	0.311 - 0	2,000 - 609
Peas (downy mildew)	0.146	0.354	2,589
Sunflowers (downy mildew)	0.62	0	609
Cereals (Pythium)	0.046 - 0.11	0.454 - 0.39	8,217 - 3,436
Sorghum (Pythium and downy mildew)	0.093 - 0.11 (Pythium) 0.189 (downy mildew)	0.407 - 0.39 (Pythium) 0.311 (downy mildew)	4,064 - 3,436 (Pythium) 2,000 (downy mildew)
Bird's-foot trefoil	0.046 - 0.11	0.454 - 0.39	8,217 - 3,436

Registered Mixes:

Compatible on the seed with the following products:

Alfalfa, Peas	Thiram 75WP
Beans	Vitaflo 280
Canola, Rapeseed	Cloak, Vitavax RS, Vitavax RS Dynaseal
Low Tannin Lentil	Crown

Application:

Apron FL contains no colourant. An appropriate dye such as Pro-Ized Dye must be added to slurry before treating seed. When preparing the slurry the following procedure should be used: 1. Partially fill the mixing tank with water. 2. Add the required quantity of Apron FL onto the water surface. 3. Allow products to disperse and switch on agitation. 4. Top up with extra water to required volume and maintain agitation during use. 5. Add colourant last.

Restrictions:

Use: 1. Treated seed must not be used for food, feed or oil processing. 2. Treated seed may be toxic to birds and other wildlife. Clean up any spilled seed. Ensure that treated seed is properly incorporated at planting. 3. Treated seed must be labelled as follows; **"This seed has been treated with Apron FL seed protectant which contains metalaxyl. Do not use for feed, food or oil processing."**

Grazing: Do not graze or feed livestock on treated areas for 4 weeks after planting.

Storage: Do not store above 35°C or below 0°C. Store in original container, away from pesticides, food or feed. All bags containing seed for export must be labelled "For Export Only."

Comments:

Treatment of highly mechanically damaged, poor quality or low vigour seed may result in reduced germination and/or reduced seed and seedling vigour. If seed lot quality is unknown conduct a germination test on a small portion of seed before treatment.

Baytan 30

Company:

Gustafson

Formulation:

317 g/L triadimenol formulated as a liquid seed treatment. Container size - 3.78 L.

Crops:

Wheat, barley.

Diseases Controlled:

Wheat and Winter Wheat - loose smut, common bunt, powdery mildew (early season control), and suppression of take-all.

Barley - true loose smut, covered smut, false loose smut, leaf stripe, suppression of net blotch, scald and common root rot.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient triadimenol is a triazole fungicide with systemic activity.

Cost:

$2.87 to $5.74/25 kg seed

(1999 suggested retail price)

Rates and Water Volumes:

0.05 L per 100 kg seed will control:
Barley - smuts, leaf stripe and suppression of common root rot and scald
Spring wheat - smuts, powdery mildew
Winter wheat - smuts

0.1 L per 100 kg of seed will control:
Barley - suppression of net blotch
Winter wheat - powdery mildew and suppression of take-all

BAYTAN 30 (L per 100 kg seed)	WATER REQUIRED (L)	SLURRY RATE (L)	KG SEED TREATED PER JUG
0.05	0.2 - 0.45	0.25 - 0.5	7,460
0.1	0.15 - 0.4	0.25 - 0.5	3,780

Registered Mix:

Baytan 30 can be applied on seed treated with Vitaflo 280.

Restrictions:

Storage: Do not store treated seed. Treated seed must be labelled **"This seed has been treated with Baytan 30 - contains triadimenol. Do not use for feed, food or oil processing."** Store product in original container only, away from other pesticides, fertilizer, food or feed. Keep container closed.

Grazing: Do not graze livestock on treated areas for 40 days after planting.

Comments:

Baytan 30 is a seed treatment available to commercial applicators only. Seed treated with this product will sometimes emerge at a slower rate than untreated seed. Avoid late planting of treated winter wheat. Germination and seed vigour may also be reduced under adverse environmental conditions such as cool, wet soil or seed planted greater than a 4 cm depth. Baytan 30 contains no colourant. An appropriate dye such as Pro-Ized Dye must be added before treating seed. No colourant is required if applying over seed treated with Vitaflo 280.

Benlate/Benlate Toss-N-Go

Company:

DuPont Canada Inc.

Formulation:

50 percent benomyl formulated as a wettable powder.

Container sizes - Benlate - 10 kg, Benlate Toss-N-Go - 10 kg (1 kg water soluble bag, 5 x 1 kg per pouch, 2 x 5 kg pouch per case).

Crops:

Canola, field beans, seed alfalfa.

Diseases Controlled:

Sclerotinia in canola.

Sclerotinia and botrytis in field, dry (white) and snap common beans and alfalfa grown for seed.

Crop Stage:

Beans - Apply between the stage when 50 percent of all plants have one open flower and full bloom.

Canola - Can be applied up to the 50 percent bloom stage. Optimum protection is from 20 to 30 percent bloom stage, which is before the first petals begin to fall and where there is maximum number of petals and buds that can be covered by the spray.

Alfalfa - Apply between early bloom and full bloom.

How it Works:

The active ingredient benomyl is a benzimidazole fungicide with systemic activity.

Cost:

$15.45 to $20.60/acre for canola

$36.56 to $46.87/acre for beans

$31.42/acre for alfalfa (1999 suggested retail prices).

Rate:

0.3 to 0.4 kg/acre (one 10 kg container treats 33 to 25 acres) for canola. Use the high rate for application after 30% bloom, or under severe prolonged disease conditions (i.e. heavy crop canopy, high humidity, and/or excessive moisture).

0.71 to 0.91 kg/acre (one 10 kg container treats 14 to 11 acres) for beans.

0.61 kg/acre (one 10 kg container treats 17 acres) for alfalfa.

Water Volume:

Beans, alfalfa - ground - 10 to 20 gallons/acre (40 to 80 L/acre).

Air - 3 gallons/acre (14 L/acre).

Canola - ground - minimum 8 to 10 gallons/acre (32 to 40 L/acre).

Air - minimum 3 gallons/acre (14 L/acre).

Nozzles:

Hollow cone or flat fan for ground and properly calibrated aerial equipment.

Effects of Weather:

Rainfast within 1 to 2 hours of application. Do not irrigate within 6 hours of application.

Tank Mixes:

Do not mix with alkaline pesticides such as basic copper sulphate. Do not tank mix or alternate with thiophanate products (Easout).

Restrictions:

Grazing: Do not feed treated hay to livestock.

Preharvest Interval: 14 days.

Storage: Do not allow product to become wet during storage. Keep away from fires or sparks.

Bravo 500

Company:

Zeneca Agro

Formulation:

500 g/L chlorothalonil formulated as a suspension. Container sizes - 10 L, 200 L.

Crops:

Wheat (all wheat including durum & winter wheat), potatoes, lentils, chickpeas and field peas.

Diseases Controlled:

Wheat - Tan Spot, Septoria Glume Blotch, Septoria Leaf Spot. Suppression of Fusarium Head Blight (Scab).

Potatoes - Early and late blight, Botrytis vine rot.

Lentils - Anthracnose and Ascochyta blight.

Chickpeas - Ascochyta blight

Peas - Ascochyta blight (*Mycosphaerella pinodes*).

Crop Stage:

Wheat - For control of Tan Spot and Septoria, begin application at flag leaf emergence and repeat 10 - 14 days later when ears are visible. Apply again when ears are fully emerged and if necessary, should conditions favour disease spread. For suppression of Fusarium Head Blight apply Bravo at early flowering. For best results, this application must be made before flowering has started and before the beginning of weather favouring disease. Do not make more than 3 applications per season. Rates and number of applications will depend upon disease severity and weather conditions.

Potatoes - Begin applications when plants are 6 to 8 inches (15 to 20 cm) high or when disease threatens. Repeat applications at 7 to 10-day intervals or as necessary to maintain disease control. Under severe disease conditions use the higher rates at 7-day intervals.

Lentils - One application, must occur at early flowering.

Two applications - first application before flowering when bud formation is evident. Second application must occur at early to mid-flowering, 10 to 14 days after the first application, but before rows close in to form a dense canopy.

Rates and number of applications will depend upon disease severity and weather conditions.

Chickpeas - make first application at early flowering. Remaining applications can be made at 10-day intervals. Do not make more than 3 applications per season. Rate and number of applications will depend upon disease severity and weather conditions.

Peas - Begin applications at early flowering and repeat 10 days later at early pod set or mid-flowering. Make a third application 10 - 14 days after the second application at pod fill or later flowering should conditions remain favourable for disease. Do not make more than 3 applications per season. Rates and the number of applications will depend upon disease severity and weather conditions.

How it Works:

The active ingredient chlorothalonil is a phthalimide fungicide with contact activity.

Cost:

$8.16 to $13.60/acre for wheat.

$6.53 to $13.60/acre for potatoes.

$16.32 to $21.76/acre for chickpeas.

$10.88 to $21.76/acre for lentils.

$10.88 to $17.00/acre for peas.

(1999 suggested retail prices).

Rate:

Wheat - 0.60 L to 1.0 L/acre for the control of Tan Spot and Septoria.

0.80 L to 1.0 L/acre for the suppression of Fusarium Head Blight.

Potatoes - 0.48 to 1 L/acre for control of late blight. 0.65 to 1 L/acre for control of early blight and botrytis stem rot.

Lentils - 0.8 to 1.6 L/acre.

Chickpeas - 1.2 to 1.6 L/acre for first application. 0.8 to 1.2 L/acre for subsequent applications.

Peas - 0.8 L to 1.25 L/acre for the control of Ascochyta Blight (*Mycosphaerella pinodes*).

Water Volume:

Volume will vary with amount of plant growth. Use sufficient water to obtain adequate spray coverage. Spray volume will usually range from 20 to 140 gallons/acre (90 to 640 L/acre) for dilute sprays and 4.4 to 8.8 gallons/acre (20 to 40 L/acre) for concentrate sprays.

Chickpeas - 20 gallons/acre (90 L/acre).

Tank Mixes:

Do not combine with pesticides, surfactants or fertilizers unless prior use has shown the combination physically compatible and non-injurious under your conditions of use.

Restrictions:

Grazing: Do not graze treated areas. Do not feed straw from treated crop to livestock.

Preharvest: Potato - 1 day preharvest interval.

Lentils and chickpeas - 48 day preharvest interval.

Wheat - 30 day preharvest interval.

Peas - 32 day preharvest interval.

Recropping: None.

Application: On lentils do not make more than 2 applications in the same season. On chickpeas, wheat and peas, do not make more than 3 applications per season. Do not apply by air for chickpeas.

Environmental: Do not apply if weather conditions favour drift from area being treated. Do not contaminate lakes, streams or ponds. Allow a buffer zone of 15 m between area being treated and aquatic systems for ground applications and a buffer zone of 100 m for aerial application.

Re-entry: Do not re-enter treated area within 48 hours. If required, and at least 4 hours have passed since application, individuals may re-enter treated area for short-term tasks not involving hand labour. Long pants, long-sleeved shirt, and chemical resistant gloves must be worn.

Storage: Store in a cool, dry, ventilated place. Protect from excessive heat.

Hazard Rating:

Warning, causes severe eye damage.

Bravo/Ridomil

Company:

Zeneca Agro

Formulation:

500 g/L chlorothalonil and 240 g/L metalaxyl in a Twin-Pac Jug. Container size - 11.33 L.

Crops:

Potatoes.

Diseases Controlled:

Early blight, late blight, late blight tuber rot, Botrytis vine rot. Suppression of Pythium leak and Pinkrot.

Crop Stage:

Begin preventive applications, at 14-day intervals, early in the season when conditions are favourable for disease, (before infection), but no later than when the plant foliage meets within the row uniformly across the field. For effective control of late blight tuber rot, apply Bravo/Ridomil at the time of flowering and make a second application 14 days later. Do not make more than three applications per season.

How it Works:

The chlorothalonil component is a phthalimide fungicide with contact activity. The metalaxyl component is an acylalanine fungicide with systemic activity.

Cost:

$28.27/acre (1999 suggested retail price).

Rate:

One 11.33 L jug treats 10 acres. The entire contents of the jug must be added to the spray tank or an improper mixture will result.

Water Volume:

Ground - use sufficient water to ensure thorough coverage of foliage. Use a water volume of 20 to 140 gallons/acre (90 to 640 L/acre).

Aerial - use a minimum water volume of 5 gallons water/acre (23 L/acre).

Tank Mixes:

None registered.

Restrictions:

Resistance: Strains of late blight resistant to metalalaxyl may develop especially when applied after disease is present. If late blight develops in the field, contact government Potato Specialist or Plant Disease Specialist.

Storage: Protect from excessive heat.

Environmental: Do not use on coarse textured gravelly soils, soils with less than 2% organic matter or in areas where the water table may be high. Avoid application when weather favours drift. Avoid application by ground or air near or around bodies of water. Do not contaminate streams or ponds by spray drift, by cleaning equipment, or disposal of wastes. A buffer zone of 100 m for aerial application and 15 m for ground application should be observed to protect water bodies.

Hazard Rating:

Warning Poison
Warning, causes severe eye damage.

Captan Flowable

Company:

Norac Concepts Inc.

Formulation:

30 percent captan formulated as a flowable seed treatment. Container sizes - 20 L, 1000 L.

Crops:

Corn, beans, peas, soybeans.

Diseases Controlled:

Storage rot, seed decay, root rot, damping off, seedling blight.

Crop Stage:

Prior to storage or as a seed treatment.

How it Works:

Captan is a phthalimide fungicide with protective activity.

Cost:

$0.95 per 25 kg of bean, pea or soybean seed.
$0.41 per 25 kg corn seed.
(1999 suggested retail prices).

Rates:

CROP	CAPTAN FLOWABLE (L per 25 kg seed)
Beans	0.07
Corn (field)	0.03* - 0.05
Peas	0.07
Soybeans	0.07

*At this rate product is to be applied only by a professional applicator using equipment which will assure complete and uniform coverage.

Restrictions:

Storage: Do not freeze. Product must be stored at ambient temperatures above 0°C and must not be stored with herbicides, feed, food or fertilizer. All treated seed should be labelled, **"Poisonous to man and animals. Do not use for food or feed. Do not sell to oil mills. This seed has been treated with Captan."**

Champion WP

Company:

Van Waters and Rogers Ltd.

Formulations:

50 percent copper equivalent as copper hydroxide formulated as a wettable powder. Container size - 10 kg.

Crops:

Beans, potatoes.

Diseases Controlled:

Beans - Bacterial blight (common and halo)

Potatoes - early and late blight

Crop Stage:

Beans - Apply first application when plants are 15 cm (6 inches) high. Continue application every 7 to 14 days depending on weather conditions and disease pressure.

Potatoes - Apply Champion WP in combination with mancozeb (80 percent) every 7 to 14 days starting when plants are 15 cm (6 inches) high until harvest. Apply Champion WP either with a desiccant at vine kill or alone after vine kill but prior to harvest to reduce late blight tuber infections at harvest.

How it Works:

The active ingredient copper hydroxide is an inorganic fungicide/bactericide with contact activity.

Cost:

$12.05/kg

(1999 suggested retail prices).

Rate:

Beans - 0.9 to 1.3 kg/acre.

Potatoes - 0.44 to 1.0 kg/acre with mancozeb (80 percent) at 0.7 to 0.9 kg/acre.

Restrictions:

Preharvest Interval: 1 day.

Environmental: Do not contaminate any body of water.

Storage: Store in a cool, dry and well-ventilated area in original container.

Hazard Rating:

Caution Poison

Clean Crop Copper 53W/Clean Crop Copper Spray/ Kocide 101/Kocide DF/Guardsman Copper Oxychloride 50

Company:

United Agri Products, (Clean Crop Copper 53W, Clean Crop Copper Spray).

Griffin, distributed by United Agri Products (Kocide)

Van Waters and Rogers Ltd. (Guardsman Copper Oxychloride 50)

Formulation:

Clean Crop Copper 53 W - 53 percent tribasic copper sulphate formulated as a wettable powder.
Container size - 10 kg.

Clean Crop Copper Spray - 50 percent copper oxychloride formulated as a wettable powder.
Container size - 10 x 2 kg case.

Guardsman Copper Oxychloride 50 - 50 percent copper oxychloride formulated as a wettable powder.
Container size - 25 kg.

Kocide 101 - 50 percent copper as copper hydroxide formulated as a wettable powder.
Container size - 5 kg.

Kocide DF - 40 percent copper as copper hydroxide formulated as a dry flowable.
Container size - 10 kg.

Crops:

Potatoes, beans.

Diseases Controlled:

PRODUCT	POTATO	BEAN
Clean Crop Copper 53W	Early and late blight	Anthracnose Downy Mildew Bacterial Blight
Clean Crop Copper spray	Early and late blight	
Guardsman Copper Oxychloride 50	Early and late blight	
Kocide 101	Early and late blight	Bacterial blight (bacterial and halo)
Kocide DF	Early and late blight	

Crop Stage:

Potatoes - (Clean Crop Copper 53W, Clean Crop Copper Spray, Guardsman Copper Oxychloride 50) - Apply when plants are 4 to 8 inches (10 to 20 cm) tall. Repeat at 7 to 10 day intervals.

(Kocide 101, DF) - Apply when plants are 6 inches (15 cm) tall. Apply combined with 0.7 to 0.9 kg of a mancozeb product per acre, at 7 to 10 day intervals. Kocide may be applied at the highest rate with a desiccant at vine kill or alone after vine kill, prior to harvest, to reduce the risk of late blight tuber infection.

Beans - First application when plants are 6 inches (15 cm) tall, as a protectant. Repeat every 7 to 14 days depending on local conditions.

How it Works:

The active ingredients tribasic copper sulphate, copper oxychloride and copper hydroxide are inorganic fungicides with contact activity.

Cost:

Clean Crop Copper 53W - $22.80/kg

Clean Crop Copper Spray - $12.20/kg

Kocide 101 - $11.23/kg

Kocide DF - $12.00/kg

(1999 suggested retail prices)

Rate:

Product	Potato (kg/acre)	Acres treated by 1 container	Beans (kg/acre)	Acres treated by 1 container
Clean Crop Copper 53W	2.2	4.5	2.2	4.5
Clean Crop Copper Spray	1.6	6.25		
Guardsman Copper Oychloride 50	1.6	15.6		
Kocide 101	0.44 - 0.9 1.38 (vine kill)	11.4 - 5.5 3.7 (vine kill)	0.9 - 1.3	5.5 - 3.8
Kocide DF	0.44 - 0.69 1.38 (vine kill)	23 - 14.5 7.3 (vine kill)		

Water Volume:

Kocide 101, DF - Enough to ensure thorough coverage. Check label.

Copper Oxychloride 50, Clean Crop Copper 53W and Copper Spray - 88 gallons/acre (400 L/acre).

Restrictions:

Storage: Store in cool, dry, ventilated area, away from feed or food. Keep away from heat, fire and sparks.

Preharvest Interval: 1 day.

Environmental: Do not apply or allow to drift onto streams or any body of water.

Hazard Rating:

Warning Poison (Copper 53W, Copper Spray)

Caution Poison (Kocide 101)

Danger Poison (Kocide DF)

Crown

Company:

Gustafson

Formulation:

92 g/L carbathiin and 58 g/L thiabendazole, formulated as a liquid seed treatment. Container size - 10 L.

Crops:

Lentils.

Diseases Controlled:

Seed-borne Ascochyta, seedling blights and seed rots caused by Botrytis, Fusarium and Rhizoctonia fungi.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient carbathiin is a systemic fungicide and the active ingredient thiabendazole is a benzimidazole fungicide with systemic activity.

Cost:

$7.00/25 kg of seed
(1999 suggested retail price).

Rate:

0.15 L per 25 kg of seed.

Compatibility with Rhizobia:

Crown is compatible with rhizobia. Contains a sticker for peat rhizobia. DO NOT TANK MIX CROWN WITH RHIZOBIA. Crown and rhizobia can be applied simultaneously to seed through separate systems or applied sequentially.

Application:

Commercial Treaters and On-Farm Auger Treating: Crown is a ready to use formulation designed for commercial treaters and on-farm auger treating. Crown is added directly to the seed as it enters a mixing chamber or auger. It is important that the seed and chemical be mixed quickly and uniformly. See instructions supplied with the applicable treater system for information on proper application techniques. When a grain auger is used for treating, running the auger less than full is the key to adequate mixing. Augers used for handling treated seed should not be used to move seed for food, feed or oil processing.

Applications to Seed in a Hopper Box or Seed Drill: Partially fill the hopper box or seed drill with a pre-measured amount of seed. Apply the proper amount of Crown evenly over the surface of the seed using 150 mL of Crown per 25 kg of lentil seed. DO NOT pour in one area. Mix with a paddle until all seed is of a uniform red colour, indicating adequate coverage. DO NOT MIX WITH HANDS. Repeat this procedure until all the hopper box or seed drill is filled. Seed can be planted immediately after treatment without drying.

Restrictions:

Feeding: Do not graze or feed livestock on treated areas for 4 weeks after planting.

Use: Treated seed may be toxic to birds and other wildlife. Clean up any spilled seed. Ensure treated seed is properly incorporated at planting. Treated seed must not be used for food or feed.

Storage: Do not store above 35°C or below 0°C or in direct sunlight. Store in original container only, away from other pesticides, fertilizers, food or feed. Treated seed must be labelled as follows: **"This seed has been treated with Crown seed protectant, which contains carbathiin and thiabendazole. Do not use for food, feed or oil processing."**

DB-Green L

Company:

Agsco, distributed by United Agri Products

Formulation:

323 g/L maneb plus 108 g/L lindane formulated as a liquid seed treatment.
Container size - 57 L (15 U.S. gallons).

Crops:

Wheat, barley, oats, rye.

Diseases Controlled:

WHEAT	BARLEY	OATS	RYE
common bunt root rot seedling blight - including fusarium	covered smut false loose smut root rot seedling blight	covered smut root rot seedling blight	common bunt root rot seedling blight

Insects Controlled:

Wireworms.

Crop Stage:

Seed treatment.

How it Works:

The ingredient maneb is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Cost:

$1.50/25 kg of seed for wheat
$1.91/25 kg of seed for barley
$2.66/25 kg of seed for oats
$1.25/25 kg of seed for rye
(1999 suggested retail prices).

Rate:

0.078L/25 kg of seed - wheat
0.099L/25 kg of seed - barley
0.138L/25 kg of seed - oats
0.065L/25 kg of seed - rye

Restrictions:

Storage: Store in a cool, dry area. If product becomes frozen, thaw and shake or agitate. If treated seed is stored, label container, "**This seed has been treated with Agsco DB Green L Seed Treatment. Do not use for food, feed or processing.**" Excess treated seed should not be stored past planting time.

Environmental: Do not contaminate ponds, lakes or streams.

Hazard Rating:

Danger Poison

DCT

Company:

Norac Concepts Inc.

Formulation:

6 percent diazinon, 18 percent captan, and 14 percent thiophanate-methyl formulated as a seed treatment powder. Container size - 10 kg, 400 g.

Crops:

Field beans.

Diseases Controlled:

Seedling blight, seed rot, seed-borne anthracnose. This product will not control anthracnose if seed is severely infected.

Insects Controlled:

Root maggots.

Crop Stage:

Seed treatment. For best results, seed should be planted within a week of treating.

How it Works:

The active ingredient captan is a phthalimide fungicide with protective activity. The active ingredient thiophanate-methyl is a benzimidazole fungicide with systemic activity. The diazinon component is an organophosphate insecticide with contact and stomach activity.

Cost:

$5.29 per 25 kg of seed

(1999 suggested retail price).

Rate:

For slurry machines - 0.52 kg per 1 L water. Use 1 L of slurry per 100 kg of seed.

For hand mixing - 0.13 kg per 0.35 L water. Use 0.35 L of slurry per 25 kg of seed.

Restrictions:

Storage: Do not store treated seed for more than one month. Treated seed should be coloured and labelled **"Poisonous to man and animals. This seed has been treated with Diazinon, Captan and thiophanate-methyl for control of insects and seed-borne diseases. Do not use for food or feed purposes."**

Hazard Rating:

Danger Poison

Dithane DG/Dithane DG Rainshield NT/ Manzate 200-DF

Company:

Rohm and Haas (Dithane DG/Dithane DG Rainshield NT)

DuPont Canada Inc. (Manzate 200-DF)

Formulations:

Manzate 200-DF - 75 percent mancozeb formulated as a dry flowable powder.
Container sizes - 20 kg, 2.5 kg.

Dithane DG/Dithane DG Rainshield NT - 75 percent mancozeb formulated as a dispersible granule.
Container size - 20 kg.

Crops:

Potatoes, wheat (Dithane/Dithane DG Rainshield NT only).

Diseases Controlled:

	DITHANE DG, DITHANE DG RAINSHIELD NT	MANZATE 200 DF
Wheat	Tanspot, leaf rust, Septoria leaf blotch	
Potatoes	Early and late blight	Early and late blight

Crop Stage:

Potatoes - Apply when plants are 4 to 6 inches (10 to 15 cm) high; repeat at 7 to 10-day intervals. With Dithane, spray interval may be reduced to 5 - 6 days during periods of wet weather favoring late blight and/or vigorous crop growth.

Wheat - May be applied early (when crop is in the 3 leaf to tillering stage) and/or late (when head is fully emerged, but prior to flowering). Do not make more than 2 applications per season.

How it Works:

The active ingredient mancozeb is a dithiocarbamate fungicide with contact activity.

Cost:

Dithane DG/Dithane DG Rainshield NT - $3.75 to $7.49/acre.
Manzate 200-DF - Not available.

(1999 suggested retail prices).

Rate:

Potatoes - 0.45 to 0.90 kg/acre.

Wheat (early) - 0.45 kg/acre; wheat (late) - 0.9 kg/acre.

Nozzles:

Dithane DG - flat fan.

Water Volume:

Manzate 200-DF - 17 to 100 gallons/acre (80 to 400 L/acre) by ground sprayer; 5 to 7 gallons/acre (20 to 32 L/acre) by air.

Dithane DG/Dithane DG Rainshield NT - 10 gallons/acre (45 L/acre) by ground.

Use 4 gallons/acre (18 L/acre) by air.

Effects of Weather:

Dithane DG/Dithane DG Rainshield NT - must be dry on plant leaf prior to rainfall; approximately 1 hour is required without rainfall at moderate temperatures and humidity.

Tank Mixes:

For Dithane DG add other co-applied fungicides, insecticides, growth regulators, micronutrients and spray adjuvants to the tank last.

Restrictions:

Grazing: Do not feed treated straw or plant tops to livestock.

Preharvest: Potatoes - 1 day.

Wheat - 40 days.

Environmental: Do not apply if weather favours drift from areas treated. Do not apply to water or wetlands.

Storage: Store in cool, dry, well-ventilated place. Keep away from fire and sparks.

Hazard Rating:

Warning Poison - Manzate 200 DF

Dithane F-45

Company:
Rohm and Haas Canada Inc.

Formulation:
37 percent mancozeb formulated as a flowable.

Crop:
Seed potatoes in storage.

Diseases Controlled:
Fusarium dry rot.

Crop Stage:
Storage treatment for harvested tubers to be used for seed. Thorough uniform coverage is essential for good disease control.

Rate:
1.58 L/1000 kg seed potatoes.

Water Volume:
Apply in 4 to 8 L of water as a spray on conveyor belt prior to storage.

Cost:
$7.00/L (1999 suggested retail price)

How it Works:
Mancozeb is a dithiocarbamate fungicide with contact activity.

Restrictions:
Storage: Do not allow product to freeze. Keep away from fire and sparks. Store in a cool dry well-ventilated place away from feed or food.

Environmental: Do not apply to water or wetlands. Do not contaminate water by cleaning of equipment or disposal of wastes.

Dividend XL RTA

Company:

Novartis Crop Protection

Formulation:

3.21 percent difenoconazole, 0.27 percent metalaxyl-M formulated as a flowable seed treatment. The formulation contains a colouring agent which will colour the treated seed. Container size - 2 x 10 L jugs, 208 L drum.

Crop:

Spring Wheat, Durum, Winter Wheat.

Diseases Controlled:

Dividend XL RTA is a ready-to-use systemic seed dressing which controls or suppresses certain seed- and soil-borne diseases of wheat.

Crop Stage:

Seed treatment.

Cost:

$2.05-$4.10/bu (1999 suggested retail price)

Rates and Diseases Controlled:

Crop	Rate/ 100 kg seed	Diseases Controlled	Diseases Suppressed[2]	Early Season Foliar Diseases Controlled[1]
Winter Wheat	650 mL	Common Bunt[3], Dwarf Bunt, Loose Smut, Seed-Borne *Septoria*, Seed Borne *Fusarium*, General Seed Rots[4], *Pythium* Damping Off	Common Root Rot (*Cochliobolus* spp.), Take All	*Septoria* Leaf Blotch
	325 mL	Common Bunt[3], Dwarf Bunt, Loose Smut, Seed-Borne *Fusarium*, General Seed Rots[4], *Pythium* Damping Off	Common Root Rot (*Cochliobolus* spp.), Take All	
Spring Wheat	650 mL	Common Bunt[3], Loose Smut, Seed-Borne *Septoria*, Seed-Borne *Fusarium*, General Seed Rots[4], *Pythium* Damping Off	Common Root Rot (*Cochliobolus* spp.), Take All	
	325 mL	Common Bunt[3], Loose Smut, Seed-Borne *Fusarium*, General Seed Rots[4], *Pythium* Damping Off	Common Root Rot (*Cochliobolus* spp.), Take All	

[1] Dividend XL RTA provides control of early season *Septoria* leaf blotch in winter wheat for the first six (6) weeks after planting. For full season control, apply a foliar fungicide according to label directions.

[2] Suppression means consistent control at a level which is not optimal but is still of commercial benefit.

[3] Dividend XL RTA controls both seed and soil-borne common bunt.

[4] General seed rots controlled include those caused by saprophytic organisms such as *Penicillium* and *Aspergillus*.

Water Volume:

Dividend XL RTA (ready to apply) does not require addition of water for application. However, when using the Flexi-Coil Seed Treatment Unit, Dividend XL RTA must be diluted with water to reach 99 mL/10 kg of seed. The recommended dilution rate is 1 part Dividend XL RTA to 2 parts water. This is equal to 33 ml of Dividend plus 66 ml of water in order to achieve the total liquid volume requirement of 99 ml/10 kg seed.

How it Works:

The active ingredient difenoconazole is a systemic fungicide from the triazole chemical class that provides broad spectrum protection against seed and soil-borne diseases. Metalaxyl-M is a phenylamide fungicide with systemic activity against diseases caused by the Oomycetes class, including Pythium damping-off.

Application:

Dividend XL RTA is a ready-to-apply formulation for use in commercial seed treatment plants, and for on-farm treatment using standard gravity flow or mist-type seed treatment equipment which accurately meters and mixes a flowable seed treatment. The equipment must provide uniform coverage of Dividend XL RTA on the seed. Uneven seed coverage may not give the desired level of disease control.

Consult the manufacturer of the application equipment for suitability for this application and for instructions on operation and calibration of the equipment.

Restrictions:

Environmental: Do not apply to water or wetlands. Do not contaminate water by cleaning of equipment or disposal of wastes.

Storage: Keep in heated storage. Product will freeze at -10°C.

Precautions:

When handling Dividend XL RTA, contaminated equipment or seed treated with Dividend XL RTA, wear long pants, a long-sleeved shirt and chemical resistant gloves.

Treated seed should be labelled "This seed has been treated with Dividend XL RTA; do NOT use for food or feed."

Hazard Rating:

None.

Foundation

Company:

Rhone-Poulenc Canada Inc.

Formulation:

99 g/L of iprodione, 66 g/L of thiram and 495 g/L of lindane. Container size - 100 L, 200 L, 1,000 L.

Crops:

Canola, mustard.

Diseases Controlled:

Damping off and root rot caused by *Rhizoctonia solani*, seed borne blackleg and Alternaria black spot.

Insects Controlled:

Flea beetles.

Crop Stage:

Seed treatment. This treatment only provides early season control against seed-borne blackleg.

How it Works:

The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient iprodione is a dicarboximide fungicide with contact and eradicant activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Cost:

$40.00/L (1999 suggested retail price).

Rate:

30 mL/kg seed
750 mL treats 25 kg bag of seed.
100 L container treats 3,333 kg of seed
200 L container treats 6,666 kg of seed
1,000 L container treats 33,333 kg of seed

Tank Mixes:

Foundation treated seed can be mixed with the granular insecticide Furadan CR-10 and Counter 5G. Refer to labels of both products for use recommendations and all safety precautions.

Restrictions:

Storage: Protect product from frost. Store treated seed in cool, dry conditions. Do not store treated seed for more than 6 months. Treated seed stored for more than 6 months should be tested for germination. Treated seed must be labelled "**This seed has been treated with FOUNDATION containing iprodione, thiram and lindane. Do not use for feed, food or oil processing.**"

Environmental: Do not contaminate domestic or irrigation waters.

Precautions:

Do not consume alcoholic beverages 24 hours before or after working with thiram.

Hazard Rating:

Danger Poison

Foundation Lite

Company:
Rhone-Poulenc Canada Ltd.

Formulation:
132 g/L iprodione and 88 g/L thiram.

Container size - 100 L, 200 L, 1000 L.

Crop:
Canola, mustard.

Diseases Controlled:
Damping off and root rot caused by *Rhizoctonia solani*, seed-borne blackleg and seed-borne Alternaria black spot.

Crop Stage:
Seed treatment.

Cost:
$36.00/L (1999 suggested retail price).

Rate:
22.5 mL/kg of seed. (563 mL/ 25 kg bag of seed.)

Add to the seed slowly and mix well for at least 3 to 5 minutes in treating equipment. Thorough seed coverage is required.

100 L container treats 4,444 kg of seed, 200 L container treats 8,888 kg of seed, 1,000 L container treats 44,444 kg of seed.

How it Works:
The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient iprodione is a dicarboximide fungicide with contact and eradicant activity.

Registered Mixes:
Insecticides: Treated seed can be mixed with the granular insecticide Counter 5G. Refer to the Counter 5G label for recommendations and precautions.

Restrictions:
Storage: Store product in a cool dry place and protect from frost. Store treated seed in cool dry conditions. Do not store treated seed for more than 6 months. Treated seed stored for periods in excess of 6 months may decrease in germination at a faster rate than untreated seed. Treated seed stored for more than 6 months should be tested for germination before planting. Treated seed must be labelled **"This seed has been treated with Foundation Lite containing iprodione and thiram. Do not use for feed, food or oil processing."** Date of treatment must also be included.

Environmental: Do not contaminate domestic or irrigation waters.

Precautions:
Do not consume alcoholic beverages 24 hours before or after working with thiram.

Hazard Rating:
Caution Poison

General Storage Disinfectant

Company:

Ag Services Inc. distributed by Van Waters & Rogers

Formulation:

10 percent quarternary ammonia, formulated as a liquid. Container sizes - 4 L, 20 L.

Crops:

Potatoes (disinfectant for seed potato storage areas and equipment).

Disease Controlled:

Bacterial ring rot.

Cost:

$81.00/20 L (1999 suggested retail price).

Rate:

0.060 L/10 L of water.

Application:

To disinfect walls and floors of seed potato houses, begin by removing all dirt and debris with broom or vacuum. Wash, mop or spray thoroughly with solution. Allow all treated surfaces to remain wet for at least 20 minutes. The same strength solution can be used to disinfect used bags, potato planters and other machinery after all dirt has been removed. Soak bags for at least 1 hour. Avoid contact with food products.

Storage Walls and Ceilings - use 0.6 L of disinfectant in 100 L of water. Spray areas using a high pressure jet (up to 4,250 kPa pressure) to penetrate cracks etc. in floors, A-Frames and other storage air ducts with a solution of 1.2 L of disinfectant in 100 L of water.

Tank Mixes:

Do not mix with soaps or anionic detergents.

Hazard Rating:

Caution Corrosive

Kumulus DF

Company:

BASF Canada Inc.

Formulation:

80 percent sulphur formulated as a water dispersible granular. Container size - 25 kg bag.

Crops:

Field peas.

Disease Controlled:

Powdery mildew.

Crop Stage:

Spray at first appearance of disease and repeat at 7 to 10 day intervals as necessary.

How it Works:

The active ingredient sulphur is an inorganic fungicide with contact activity.

Cost:

$1.90/acre (1999 suggested retail price).

Rate:

0.6 kg/acre (one bag treats 40 acres).

Water Volume:

Minimum of 10 gallons/acre (45 L/acre). Higher water volumes may be required later in the growing season. Use sufficient water volume to thoroughly cover all foliage.

Effects of Weather:

Do not apply when rain or night frost is expected. Do not apply if temperature is above 27°C (in shade) and high humidity prevails, or if any of the above conditions are expected within 3 days after treatment. Do not apply under intense sunshine. Do not apply when weather favours drift.

Tank Mixes:

Do not mix with dinitro compounds, tetradifon or oils.

Restrictions:

Preharvest: 1 day.

Storage: Keep away from heat, fire or sparks. Store in cool, dry, locked, well-ventilated area without floor drain.

Application: Do not apply by air. Avoid drift onto neighbouring crops.

Caution: Drift to off-target crops may cause leaf burn.

Mertect

Company:

Novartis Crop Protection

Formulation:

450 g/L thiabendazole formulated as a water dispersible suspension. Container size - 4 L.

Crops:

Potato (tubers).

Diseases Controlled:

Fusarium dry rot
Skin spot
Silver scurf
Black scurf
Pocket rot.

Crop Stage:

Postharvest treatment.

How it Works:

The active ingredient thiabendazole is a benzimidazole fungicide with systemic activity.

Cost:

Not available

Rates:

8 L/33 gallons (170 L) of water.

2 L of the above solution treats 1 metric tonne (two containers treat 89 metric tonnes).

Water Volume:

See Rates.

Restrictions:

Storage: Minimum storage temperature 0°C.

Resistance: Thiabendazole-resistant strains of silver scurf and fusarium dry rot can develop.

Tank Mixes:

Before mixing with other chemicals, consult the manufacturer.

Comments:

Do not allow suspension to stand without continuous agitation.

Potatoes must rotate along conveyor line to ensure complete coverage.

Prior to treating potatoes destined for export, confirm with authorities that treated potatoes will be allowed to enter importing country.

N-M Drill Box/N-M Dual Purpose

Company:

Interprovincial Cooperative Ltd. (IPCO)

Formulations:

N-M Drill Box - 50 percent maneb formulated as powder.
Container size - 1 kg.

N-M Dual Purpose - 37.5 percent maneb and 18.75 percent lindane formulated as powder.
Container size - 1 kg.

Crops:

Wheat, rye, oats, barley (except Palliser).
Flax (N-M Drill Box only).

Diseases Controlled:

WHEAT	BARLEY	OATS	RYE	FLAX
Stinking smut (bunt) Seed-borne seedling blight Root rot	Covered smut False loose smut Seed-borne seedling blight Root rot	Loose smut Covered smut Seed-borne seedling blight Root rot	Bunt Seed-borne seedling blight	Seedling blight Damping off

Insects Controlled:

Wireworms - N-M Dual Purpose.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient maneb is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Cost:

N-M Drill Box - $13.75/kg of product

N-M Dual Purpose - $18.25/kg of product

(1999 suggested retail prices).

Rates:

CROP	N-M DRILL BOX		N-M DUAL	
	RATE/25 KG SEED	AMOUNT SEED TREATED/PKG	RATE/25 KG SEED	AMOUNT SEED TREATED/PKG
Wheat	26 - 40 g	961 - 625 kg	52 g	480 kg
Barley	50 - 66 g	500 - 378 kg	65 g	384 kg
Oats	69 - 92 g	362 - 272 kg	92 g	271 kg
Rye	28 - 43 g	892 - 581 kg	56 g	445 kg
Flax	112 g	223 kg		

Water Volume:

Not applicable.

Tank Mixes:

Not applicable.

Restrictions:

Storage: Store in a dry, ventilated place. Avoid overheating. Keep away from fire or spark. Do not store treated seed for more than 1 year.

Do not use treated seed in feed or foodstuffs. If treated seed must be stored, label as follows: **"Poisonous to man and animals. This seed has been treated with IPCO N-M Drill Box containing maneb for the control of seed-borne diseases."** or **"Poisonous to man and animals. This seed has been treated with IPCO N-M Dual Purpose Drill Box containing lindane and maneb for the control of wireworms and seed-borne diseases. Do not use for food or feed."** At the end of seeding, clean drill thoroughly and bury any dust or seed remaining.

Hazard Rating:

Warning Poison

Polyram DF/Polyram 16D

Company:

BASF Canada Inc.

Formulation:

Polyram 16 Dust - 16 percent metiram formulated as dust.
Container size - 10 kg.

Polyram DF - contains 80 percent metiram formulated as dry flowable.
Container size - 20 kg.

Crops:

Potatoes.

Diseases Controlled:

Polyram DF	Early blight Late blight
Polyram 16D	Early blight Late blight Seed Treatments: Fusarium seed piece decay Seed-borne common scab

Crop Stage:

Potatoes: Polyram DF - Use lowest rates at 7 to 10 day intervals until plants cover the row then use highest rates until top kill; or use lowest rates at 5 to 7 day intervals beginning when plants are 6 inches (15 cm) high and continue until top kill.

Polyram 16D - Begin applications when plants are 6 inches (15 cm) high at 7 to 10-day intervals until top kill. Use lower rate for younger plants.

Potato Seed: Polyram 16D. Plant seed as soon as possible after treating.

How it Works:

The active ingredient metiram is a dithiocarbamate fungicide with contact activity.

Cost:

Not available

Tank Mixes:

Polyram DF - Do not mix with liquid fertilizers, Bordeaux mixture or hydrated lime. Mixtures with diazinon or malathion should be prepared immediately prior to use and not allowed to stand in the tank.

Rates:

CROP	FORMULATION	RATE	AMOUNT OR AREA ONE PACKAGE TREATS
Potato	Polyram DF Polyram 16D	0.44 - 0.90 kg/acre 4.8 - 5.6 kg/acre	45 - 22 acres 2.0 - 1.8 acres
Potato seed piece	Polyram 16D	0.45 - 0.65 kg/100 kg seed	2,200 - 1,538 kg

Water Volume:

For Polyram DF:

Ground - 8.8 to 17.6 gallons/acre (40 to 80 L/acre);

Aircraft - 4.8 gallons/acre (22 L/acre).

Nozzles:

Hollow cones or flat fans recommended.

Effects of Weather:

Polyram 16D & DF - When weather conditions favour disease development the shorter spray intervals may be required.

Polyram 16D - Treated potato seed should not be allowed to stand in hot sun or drying wind. Seed should not be planted into hot, dry or cold, wet soils.

Restrictions:

Grazing: Do not use treated crop parts for feed or food.

Preharvest Interval: May be applied up to the day before harvest.

Recropping: None.

Storage: Store in a cool, dry place away from flame or sparks. If product becomes wet or overheated, effectiveness is reduced and flammable vapours may be produced. Do not freeze.

Environmental: Do not apply when environmental conditions favour drift from treated area. Do not contaminate domestic or irrigation water, lakes, streams or ponds by the cleaning of equipment or otherwise.

Potato ST 16/MancoPlus/Tuberseal

Company:

Norac Concepts Inc. (Tuberseal)

United Agri Products (MancoPlus, Potato ST 16)

Formulations:

MancoPlus, Tuberseal Potato Seed Piece Dust - 16 percent mancozeb formulated as a dust. Container size - 10 kg.

Potato ST 16 - 16 percent mancozeb formulated as a dust. Container size - 20 kg.

Crops:

Potatoes.

Diseases Controlled:

Fusarium seed piece decay in potatoes.

Crop Stage:

Potato seed piece - Apply before planting. If treated whole seed is cut, make a second application to protect cut surfaces. Plant as soon as possible after treating. If cut seed is not planted immediately, store in a ventilated location to allow cut surfaces to dry.

How it Works:

The active ingredient mancozeb is a dithiocarbamate fungicide with contact activity.

Cost:

Potato ST 16 - $2.40/100 kg cut seed.

MancoPlus - not available.

Tuberseal - $2.28/100 kg cut seed.

(1999 suggested retail prices).

Rate:

Potato ST 16 - 0.5 kg/100 kg seed.

Potato Seed Treatment - 1.0 kg/100 kg seed.

MancoPlus, Tuberseal - 0.5 kg/100 kg seed.

Restrictions:

Grazing: Do not use treated seed for feed or food.

Storage: Store in cool, dry, well-ventilated place. Keep away from fire and sparks.

Hazard Rating:

Warning Poison

Premiere Plus

Company:

Zeneca Agro

Formulation:

1.6 percent thiabendazole plus 4.8 percent thiram plus 40 percent lindane.
Container sizes - 100 L, 1,000 L.

Crops:

Canola, mustard.

Diseases Controlled:

Blackleg (seed-borne), alternaria black spot (seed-borne) in canola. Preemergence damping-off and seed decay in canola and mustard.

Insects Controlled:

Flea beetles.

Crop Stage:

Seed treatment. This treatment provides only early season control against seed-borne blackleg and alternaria black spot.

How it Works:

The active ingredient thiabendazole is a benzimidazole fungicide with systemic activity. The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Cost:

Not available.

Rate:

0.7 L/25 kg seed, 10 L/355 kg seed.

Effects of Weather:

Best coverage is obtained when product is stored above 0°C before and during treating of seed.

Tank Mixes:

Not applicable.

Restrictions:

Storage: Store in a cool, dry, well-ventilated area. Do not freeze. Treated seed may be stored up to 4 months, unplanted treated seed must be labelled **"Poisonous to man and animals. This seed has been treated with thiabendazole, thiram and lindane for the control of diseases and insects. Do not use as feed or food. Do not sell to oil mills."**

Precautions:

Do not consume alcoholic beverages 24 hours before or after working with thiram.

Hazard Rating:

Danger Poison

Purogene

Company:

Bio-cide International Inc.
Distributed by United Agri Products

Formulation:

2 percent chorine dioxide formulated as a liquid. Container size - 18.9 L.

Crop:

Stored potatoes.

Diseases Controlled:

Late blight.

Crop Stage:

Prior to storage and in storage treatment for harvested potato tubers.

Cost:

$23.00/L (1999 suggested retail price).

Rate:

Must be activated prior to use. To activate, add up to 45 grams of food grade citric acid per litre of Purogene concentrate. Add the Purogene concentrate to the mixing tank before adding the citric acid and follow with the dilution with water to achieve the desired concentration.

Water Volume:

Apply 16.3 to 32.6 mL of product per tonne of potatoes.

Humidification Water:

1. For continual treatment of known high-risk storage, an initial treatment of activated Purogene should be proportioned into the humidification water at a rate of 10 mL/L of humidification water to provide 200 ppm Total Available Chlorine Dioxide. Following the initial treatment, do not exceed a rate of 50 ppm of product or 2.3 mL/L of humidification water.
2. For the periodic treatment of unknown risk storage, use activated Purogene at a rate of 10mL/L (200 ppm) as needed.

Do not add more than 8.35 L of Purogene concentrate per month to humidification water per 500 tonnes of potatoes.

How it Works:

Chlorine dioxide is an inorganic compound with contact activity.

Registered Mixes:

None.

Restrictions:

Storage: Keep away from heat, sparks and open flame. Do not expose to direct sunlight.

Re-entry: Do not re-enter treated storage bins for 2 hours after application. If it is necessary to enter storage area prior to 2 hours post-application, then a NIOSH/MSHA approved air supplied SCBA respirator must be worn. Signs restricting access to the storage bins must be posted during application and for 2 hours post-application.

Use: Do not use treated potatoes determined to be unfit for human consumption for animal feed. Treated potatoes must be washed with potable water before being marketed for transformation or consumption.

Environmental: Do not discharge effluent containing the Purogene into bodies of water, streams or other aquatic systems.

Hazard Rating:

Warning Poison

Warning Eye Irritant

Emergency Registration:

Expires June 30, 2000

Ridomil Gold MZ 68WP

Company:

Novartis Crop Protection

Formulation:

64 percent mancozeb and 4 percent metalaxyl formulated as a wettable powder. Container size - 4 kg.

Crops:

Potatoes.

Diseases Controlled:

Early and late blight. Also suppresses Pythium leak and pink rot.

Crop Stage:

Ridomil Gold MZ 68WP must be applied before the outbreak of disease. Start application early - the first application should be applied before the leaves of the plants touch in the potato row. Apply a second and third application at 10 to 14-day intervals. Under severe late blight conditions, the shorter 10-day interval is recommended. Apply a contact fungicide recommended for control of late blight 5 to 7 days after each Ridomil Gold MZ 68WP application. Following the last Ridomil Gold application, apply a contact fungicide recommended for late blight control at the recommended rate and spray interval, to the end of the season. Discontinue use of Ridomil Gold MZ 68WP when potato vines start to look mature. Do not apply more than 3 times per season.

Apply as part of a preventative disease management program. Cultural practices to minimize the sources of disease should be used as well as early preventative applications of fungicides. When changing from Ridomil Gold MZ 68WP to a contact fungicide, apply within 10 days of the last Ridomil Gold MZ 68WP application.

How it Works:

The active ingredient metalaxyl is an acylalanine fungicide with systemic activity. The active ingredient mancozeb is a dithiocarbamate fungicide with contact activity.

Cost:

$27.13/acre (1999 suggested retail price).

Rate:

Ground or air - 1 kg/acre (one 4 kg bag treats 4 acres).

Water Volume:

Ground - sufficient water to ensure thorough coverage of foliage.

Air - minimum of 4.4 gallons/acre (20 L/acre).

Tank Mixes:

None registered. Do not tank mix with a top killer. Top killers prevent the systemic activity.

Pressure:

275 kPa (40 psi).

Nozzles:

Flat fan. Spray screen should be no finer than 50 mesh. For aerial applications, adjust nozzles to provide a median droplet size of 200 - 400 microns.

Restrictions:

Grazing: Potato vines are naturally poisonous and should not be fed to livestock.

Re-entry: Do not re-enter treated areas within 12 hours.

Environmental: Do not contaminate streams, lakes, ponds, irrigation water, or water used for livestock or domestic purposes by cleaning of equipment or disposal of wastes. To minimize risk to the environment, do not use on coarse textured gravelly soils, soils with less than 2% organic matter, or in areas where the water table may be high.

Resistance: Strains of late blight resistant to metalaxyl may develop especially when applied after disease is present. If late blight develops in the field, contact government Potato Specialist or Plant Disease Specialist immediately.

Ridomil MZ 72WP

Company:

Novartis Crop Protection

Formulation:

64 percent mancozeb and 8 percent metalaxyl formulated as a wettable powder. Container size - 4 kg.

Crops:

Potatoes.

Diseases Controlled:

Early and late blight, (including tuber rot).

Crop Stage:

Apply on a 10 to 14-day preventive schedule when weather conditions favour late blight development. The first application should be made before plant leaves touch in the row and must begin before visible signs of the disease. Up to 3 applications can be made per season. A contact fungicide should be applied according to label directions 7 days after each Ridomil application. Finish off the season with a contact fungicide.

How it Works:

The active ingredient metalaxyl is an acylalanine fungicide with systemic activity. The active ingredient mancozeb is a dithiocarbamate fungicide with contact activity.

Cost:

$27.13/acre (1999 suggested retail price).

Rate:

Ground or air - 1 kg/acre (one 4 kg bag treats 4 acres).

Water Volume:

Ground: Use sufficient water to ensure thorough coverage of foliage.

Aerial: 4.4 gallons/acre (20 L/acre) minimum.

Tank Mixes:

Compatible with most potato insecticides. Do not mix with a top killer, which impedes the movement of Ridomil through the plant and thus reduces its effectiveness.

Restrictions:

Resistance: Strains of late blight resistant to metalaxyl may develop, especially when applied after disease is present. If late blight develops in the field, contact the provincial government Potato Specialist or Plant Disease Specialist immediately.

Application: Avoid application when weather favours drift.

Sprayers:

Spray screens should be no finer than 50 mesh. Maintain pressure at no less than 275 kPa (40 psi) to ensure coverage.

Ronilan EG

Company:

BASF Canada Inc.

Formulation:

50 percent vinclozolin formulated as an extruded granular fungicide. Container size - 12 kg (0.4 kg/PVC bag, 6 x 0.4 kg/pouch, 5 x 2.4 kg/pouch per box).

Crops:

Canola, beans.

Disease Controlled:

Canola - Sclerotinia stem rot.

Beans - Sclerotinia and greymold.

Crop Stage:

Canola - Apply once at 20 percent to 50 percent bloom, usually 4 to 8 days after first blooms appear in field.

Beans - Apply at early to mid bloom (30 to 50 percent) with or without a second application 7 to 14 days later at full bloom if disease persists, or weather conditions are favourable for disease development.

How it Works:

The active ingredient vinclozolin is an oxazolidine fungicide with contact activity.

Cost:

$18.36 to $24.48/acre (canola)

$24.48 to $48.96/acre (beans)

(1999 suggested retail prices).

Rate:

Canola - 0.30 - 0.40 kg/acre. The high rate is used when conditions favor sclerotinia development (heavy crop canopy, high humidity, and/or excessive rain).

Also registered for use as a split application (0.2 kg/acre per treatment) at early bloom (20-30%) and again 7 days later in canola.

Beans - 0.4 kg/acre if using 2 applications/year, 0.6 kg/acre if using 1 application/year. Do not apply more than 0.8 kg/acre per season.

Water Volume:

Canola (by ground) - 10 to 20 gallons/acre (45 to 90 L/acre).

Canola (by air) - Use minimum 3.6 gallons/acre (16 L/acre).

Beans - Use sufficient spray volume to obtain a thorough coverage of foliage. For ground application, 10 to 20 gallons/acre (45 to 90 L/acre) is recommended.

Pressure:

Minimum 275 kPa (40 psi).

Nozzles:

Cone type nozzles recommended for beans.

Effects of Weather:

Do not apply if rain or frost is expected. If rainfall is imminent, delay spraying. Do not treat plants at very low temperatures. Do not apply to any crops that have been stressed due to conditions such as hail damage, flooding, drought, etc.

Tank Mixes:

Insecticides: Lorsban and Pyrinex. See label for details on rates. Ronilan EG must be added first to mix.

Restrictions:

Grazing: Do not allow livestock to graze on treated crop.

Preharvest Interval: 45 days for beans, 40 days for canola.

Environmental: For ground application, maintain 15 m buffer zone between area sprayed and aquatic systems, for aerial application allow a 100 m buffer zone.

Storage: Store in original, tightly closed container in cool, dry, locked, well ventilated area without floor drain. Ronilan may be frozen.

Hazard Rating:

Caution Poison

Rovral Flo

Company:

Rhone Poulenc Canada Inc.

Formulation:

240 g/L iprodione formulated as a liquid flowable.
Container size - 8.4 L.

Crops:

Canola

Diseases Controlled:

Sclerotinia stem rot and suppression of Alternaria black spot.

Crop Stage:

Apply when crop is at the 20 to 30 percent bloom stage. For Argentine varieties when 15 to 20 flowers open (including small pods) on the main stem. For Polish varieties when 11 to 15 flowers (or small pods) are open on main stem. Good coverage of plants is essential.

How it Works:

The active ingredient iprodione is a dicarboximide fungicide with protective and eradicant activity.

Cost:

$18.76 to $28.14/acre

(1999 suggested retail price).

Rate:

Sclerotinia stem rot (white mold): 0.8 to 1.2 L/acre
Use of the higher rate is recommended for fields with a history of heavy disease pressure.

Alternaria black spot: 0.8 L/acre

Water Volume:

Ground - 10 gallons/acre (45 L/acre)
Air - Not less than 4.5 gallons/acre (20 L/acre)

Nozzles:

Flat fan or hollow cone for ground and properly calibrated aerial equipment.

Effects of Weather:

Do not spray in heavy dew or when rain is imminent within one hour. Spraying should be carried out in crosswind where possible. Avoid spraying in a dead calm and when wind speeds exceed 20 km/hr.

Tank Mixes:

Rovral should not be mixed with other pesticides, adjuvants or fertilizers except where stated.

Restrictions:

Preharvest Interval: None specified if applied at correct crop stage.

Storage: Protect from frost.

Hazard Rating:

Caution Poison

Sapphire

Company:

Specialty Agro Corporation

Formulation:

1.6 percent thiabendazole plus 4.8 percent thiram plus 40 percent lindane. Container size - 100L.

Crop:

Canola, mustard.

Diseases Controlled:

DISEASE	CANOLA	MUSTARD
Seed-borne alternaria blackspot	X	X
Seed-borne blackleg	X	
Pre-emergence damping off, Seed decay	X	X

Insects Controlled:

Flea beetles.

Crop Stage:

Seed treatment. This treatment provides only early season control against seed-borne blackleg and alternaria black spot.

Cost:

Not available.

Rate:

0.7 L per 25 kg seed, 10 L per 355 kg seed.

Application:

Best coverage is obtained when both product and seed to be treated are stored above 0oC before and during treating of seed.

How it Works:

The active ingredient thiabendazole is a benzimidazole fungicide with systemic activity. The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Restrictions:

Storage: Store in a cool, dry well ventilated area. Do not freeze. Treated seed may be stored for up to 4 months. If stored for more than 4 months, seed should be tested for germination before planting. Unplanted treated seed must be labelled **"Poisonous to man and animals. This seed has been treated with thiabendazole, thiram and lindane for the control of diseases and insects. Do not use as food and feed. Do not sell to oil mills."**

Precautions:

Do not consume alcoholic beverages within 24 hours before or after working with thiram.

Hazard Rating:

Danger Poison

Senator 70WP

Company:

Engage Agro Corporation

Formulation:

70 percent thiophanate-methyl formulated as wettable powder.
Container size - 1.5 kg.

Crops:

White beans.

Diseases Controlled:

Sclerotinia (white mould).

Crop Stage:

Apply when conditions favour disease development (for example, warm, humid weather and heavy, dense foliage), usually during early bloom stage, prior to rows closing in. If conditions favour disease, repeat applications may be warranted.

How it Works:

The active ingredient thiophanate-methyl is a benzimidazole fungicide with systemic activity.

Cost:

Not available.

Rate:

0.7 to 0.9 kg/acre (one container treats 2.14 to 1.67 acres).

Water Volume:

15 to 20 gallons/acre (70 to 90 L/acre).

Nozzles:

Ground - Flat fan.

Air - Hollow cone.

Tank Mixes:

Do not mix with lime or other alkaline materials.

Restrictions:

Grazing: Do not feed or allow livestock to graze on treated crops.

Storage: Store in a dry place.

Senator Potato Seed Piece Treatment

Company:

Engage Agro Corporation

Formulation:

10 percent thiophanate-methyl formulated as dust. Container size - 10 kg.

Crops:

Potatoes (seed piece treatment only).

Diseases Controlled:

Fusarium rot, Verticillium wilt, Silver scurf. Also aids in control of Seed piece decay and Blackleg infections.

Crop Stage:

Preplant seed piece treatment. Cut pieces should be treated within 6 hours of cutting. For optimum control of silver scurf, ensure that seed tubers are completely free of soil. Total skin coverage is essential.

How it Works:

The active ingredient thiophanate-methyl is a benzimidazole fungicide with systemic activity.

Cost:

Not available.

Rate:

0.5 kg per 100 kg cut seed (one container treats 2,000 kg seed).

Tank Mixes:

Do not mix with lime or other alkaline materials.

Restrictions:

Grazing: Do not feed or allow livestock to graze on treated crops.

Environmental: Do not contaminate domestic or irrigation water supplies, lakes, streams and ponds.

Storage: Store in a dry place.

Tattoo C

Company:

AgrEvo Canada Inc.

Formulation:

375 g/L propamocarb HCl and 375 g/L chlorothalonil formulated as a suspension. Container size - 10 L.

Crops:

Potatoes.

Disease Controlled:

Late blight.

Crop Stage:

Begin applications when conditions are favourable for disease, but before infection, and continue on 7 to 14-day intervals until threat of disease is over. Use the 7-day interval when the risk and conditions for disease are high. To avoid resistance, rotating and alternating applications with fungicides having different modes of action is recommended if multiple fungicide applications are required. Make no more than 3 applications per season.

How it Works:

The active ingredient propamocarb HCl is a carbamate fungicide with systemic activity. Chlorothalonil is a phthalimide fungicide with contact activity.

Cost:

$32.93/acre (1999 suggested retail price).

Rate:

1.09 L per acre.

Water Volume:

17.8 to 26.7 gallons/acre (80 to 120 L/acre).

Restrictions:

Storage: Keep away from fire, open flame or other sources of heat. Do not store below freezing. Store the tightly closed container away from seeds, fertilizers, plants and foodstuffs.

Application: Do not apply by air. Treatment with any product containing chlorothalonil must be separated by a minimum of 7 days.

Recropping: Do not plant a new crop in the treated area within 120 days of the last application.

Grazing: Do not feed treated crops to livestock.

Preharvest Interval: 7 days.

Resistance: Plant diseases can develop resistance when exposed to one type of product or even products of similar chemistry. Use cultural practices and fungicide rotation as well as early preventive fungicide applications. Consult the government Potato Specialist or Plant Disease Specialist for disease outbreak forecasts and recommendations.

Re-entry: Do not re-enter treated areas within 48 hours after treatment. If required, individuals may re-enter treated areas within 48 hours for short tasks not involving hand labour, provided that 4 hours have passed since application and that long pants and a long-sleeve shirt are worn.

Environmental: Do not apply directly to water or areas where surface water is present. Do not apply where runoff is likely to occur. Do not contaminate water when disposing of equipment wash waters. Allow a buffer zone of 15 m around bodies of water when applying.

Thiram 75WP

Company:

Gustafson

Formulation:

75 percent thiram formulated as wettable powder. Container sizes - 5 kg, 25 kg.

Crops:

Mustard, grasses, dry beans, peas, soybeans, safflower, corn, and alfalfa.

Diseases Controlled:

Seed decay, seedling blight, damping off.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient thiram is a dithiocarbamate fungicide with contact activity.

Cost:

$2.85/25 kg of mustard, grass seed.

$0.80 to $1.10/25 kg of dry bean, pea, soybean seed.

$0.95/25 kg of field corn seed.

$1.58/25 kg of safflower seed.

(1999 suggested retail prices).

Rate:

CROP	KG THIRAM/ 25 KG SEED	AMOUNT OF SEED (KG) ONE 5 KG PACKAGE TREATS
Mustard, grasses, alfalfa	0.09	1,389
Dry beans, peas, soybeans	0.025 to 0.035	5,000 - 3,571
Field corn	0.03	4,166
Safflower	0.05	2,500

Compatibility with Rhizobia Inoculum:

Thiram is compatible with rhizobia, however, some restrictions may apply in storage length with Thiram-treated seed inoculated with rhizobia. Contact rhizobia manufacturer on use patterns with their rhizobia strain.

Restrictions:

Grazing: Do not use treated seed for food or feed. Do not graze for 4 weeks after planting. Do not sell treated seed to oil mills. Label treated seed **"Do not use for food or feed. This seed has been treated with thiram."** Do not graze treated areas or feed clippings from treated areas to livestock.

Storage: Store in a cool, dry, ventilated place. Keep away from flame, sparks and heat. Unplanted treated seed must be labelled.

Precautions:

Do not consume alcohol 24 hours before or after working with thiram.

Hazard Rating:

Warning Poison

Tilt 250E

Company:

Novartis Crop Protection

Formulation:

250 g/L propiconazole formulated as an emulsifiable concentrate. Container sizes - 5 L, 4 x 5 L.

Crops:

Winter and spring wheat (including hard red, durum, Canada Prairie, soft white)

Spring Barley

Oats

Canola.

Diseases Controlled:

WHEAT	BARLEY	OATS	CANOLA
Septoria leaf spot Tan Spot Septoria glume blotch Stripe rust Powdery mildew Leaf and stem rust	Spot blotch Net blotch Scald Leaf rust Stem rust Septoria leaf spot Powdery mildew	Septoria leaf blotch Crown rust	Blackleg

Crop Stage:

Wheat, barley, oats: apply at a very early stage of disease development, anytime from the beginning of stem elongation to before the head is half emerged. Best results have been achieved when Tilt is applied just when the flag leaf emerges. Conditions that favour a good crop are often the same conditions that favour leaf diseases.

Canola: Apply during the rosette stage (between second true leaf and prior to bolting).

How it Works:

The active ingredient propiconizole is a triazole fungicide with systemic activity.

Cost:

$13.56/acre (1999 suggested retail price).

Rate:

0.2 L/acre. One 5 L container treats 25 acres.

Water Volume:

Ground: Minimum 18 gallons/acre (80 L/acre).

Air: 4 to 5 gallons/acre (16-20 L/acre).

Nozzles:

Flat fan - ground.

Flat fan or hollow cone - air.

Tank Mixes:

In wheat and barley, Tilt may be applied with: 2,4-D amine, MCPA amine, Buctril-M or Pardner.

To ensure weed and disease control:

1. Weeds and crops must be at correct growth stage.
2. Tank mixes of Tilt and Buctril-M or Pardner can only be applied by ground.
3. 2,4-D and MCPA formulations can be applied by ground or air.
4. Tilt may be applied with small amounts of nitrogen (not to exceed 1.8 kg/acre (4 lb/acre)). Add the nitrogen to the spray tank before adding Tilt. Excessive nitrogen or application during hot weather may result in crop injury. Do not add nitrogen when tank-mixing Tilt with a herbicide.

Effects of Weather:

Best results when no rainfall occurs within 1 hour of application. Should rain occur, reapplication may be necessary.

Restrictions:

Grazing: Do not graze animals on treated green crops within 3 days of application.

Preharvest Interval: Wheat, oats, barley - 45 days. Canola - 60 days.

Recropping: None.

Storage: Do not freeze.

Aerial Application: Wind speed should be less than 18 km/hr to avoid drift.

Hazard Rating:

Caution Poison

Topas 250E

Company:

Engage Agro Corporation

Formulation:

250 g/L propiconazole formulated as an emulsifiable concentrate. Container size - 2 x 6 L.

Crops:

Corn.

Diseases Controlled:

Rust, Northern corn blight, Southern corn blight, Eye spot, Helminthosporium leaf spot, Grey leaf spot

Crop Stage:

Apply when disease first appears. Under severe rust pressure, make a second application 14 days later. For rust in seed corn, a third application may be made 14 days later.

How it Works:

The active ingredient propiconizole is a triazole fungicide with systemic activity.

Rates:

DISEASE	RATE (L/ACRE)
Rust, Eye spot, Grey leaf spot	0.2
Northern corn leaf blight, Southern corn leaf blight, Helminthosporium leaf spot	0.1 - 0.2*

*Use the low rate if disease pressure is low.

Cost:

Not available.

Water Volume:

Ground: Minimum 20 gallons/acre (80 L/acre).

Air: 4 to 5 gal/acre (18 to 23 L/acre).

Nozzle:

Flat fan - ground.

Flat fan or hollow cone - air.

Tank Mixes:

Topas may be applied with small amounts of urea nitrogen (not to exceed 4 kg/acre (8.8 lb/acre) actual nitrogen). Add nitrogen to the spray tank before adding Topas. Excessive nitrogen concentration may result in crop injury.

Topas may be tank mixed with Ripcord for control of labelled diseases and insects. Crop and insects must both be at the correct stage as specified on the Topas and Ripcord labels and the preharvest interval of 14 days must be respected.

Effects of Weather:

Best results when no rainfall occurs within 1 hour of application. Should rain occur, reapplication is necessary.

Restrictions:

Grazing: Do not graze livestock on treated crop.

Preharvest Interval: 14 days

Aerial Application: Wind speed should be less than 18 km/hr to avoid drift.

Environmental: Do not spray any body of water directly or contaminate by drift or by cleaning or rinsing equipment.

Hazard Rating:

Caution Poison

Vitavax Dual Powder/Vitavax Dual Solution/ Vitaflo Dual Purpose

Company:

Gustafson

Formulation:

Vitavax Dual Powder - 20 percent carbathiin, 28.9 percent thiram, and 18.7 percent lindane formulated as powder. Container size - 1.5 kg.

Vitaflo Dual Purpose - 8.9 percent thiram, 10.1 percent carbathiin, and 12.9 percent lindane formulated as a liquid seed treatment. Container sizes - 10 L, 200 L.

Vitavax Dual Solution - 180 g/L carbathiin and 165 g/L lindane formulated as a solution. Container sizes - 10 L, 200 L.

Crops:

Vitavax Dual Powder - Wheat, barley, oats, rye, flax.

Vitavax Dual Solution - Wheat, barley, oats, rye.

Vitaflo Dual Purpose - Wheat, barley.

Diseases Controlled:

PRODUCT	BARLEY	OATS	WHEAT	RYE	FLAX
Vitavax Dual Powder	False loose smut True loose smut Covered smut	Loose smut Covered smut	Loose smut Stinking smut (Bunt)	Stem smut Damping off Seed decay	Damping off Seed decay
Vitavax Dual Solution	False loose smut True loose smut Covered smut *suppression of leaf stripe, net blotch, common root rot	Loose smut Covered smut *suppression of common root rot	Loose smut Stinking smut *suppression of common root rot	Stem smut *suppression of common root rot	
Vitaflo Dual Purpose	False loose smut True loose smut Covered smut		Loose smut Stinking smut (Bunt)		

*will not protect post-seedling plants from infection.

Seed-borne seed rots and seedling blights are generally reduced with both powder and solution.

Insects Controlled:

Wireworms.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient carbathiin has systemic activity. The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide acting as a contact and stomach poison.

Cost:

Cost to treat 25 kg of seed (1999 suggested retail prices):

CROP	VITAVAX DUAL SOLUTION	VITAVAX DUAL POWDER	VITAFLO DUAL PURPOSE
Wheat	$2.83 - $3.40	$3.15	$2.85
Barley	$2.83 - $3.40	$3.38	$3.55
Oats	$2.83	$4.60	
Rye	$2.83	$2.90	
Flax		$3.38	

Rates:

	VITAVAX DUAL POWDER		VITAVAX DUAL SOLUTION		VITAFLO DUAL PURPOSE	
CROP	KG POWDER/ 25 KG SEED	KG SEED TREATED/ CONTAINER	L/25 KG SEED	KG SEED/10 L CONTAINER	L/25 KG SEED	KG SEED/10L CONTAINER
Wheat	0.055 to 0.065	681 to 576	0.075 to 0.09	3,332 to 2,778	0.065	3,846
Barley	0.07	535	0.075 to 0.09	3,332 to 2,778	0.081	3,077
Oats	0.095	395	0.075	3,332		
Rye	0.06	625	0.075	3,332		
Flax	0.07	535				

Water Volume:

Do not dilute Vitavax Dual Solution with water.

Tank Mixes:

None.

Restrictions:

Grazing: Do not graze or feed livestock on treated area for 4 weeks after planting. Do not use treated seed for feed, food or oil processing. Treated seed must be labelled as follows: **"This seed has been treated with Vitavax Dual Solution Powder or Vitaflo Dual Purpose Seed Protectant - contains carbathiin, thiram and lindane; do not use for food, feed or oil processing."**

Storage: Do not store Vitavax Dual Solution below 0°C and keep away from spark and flame. Store powder in a dry place. Do not store seed treated with Vitavax Dual Powder. Do not store Vitaflo Dual Purpose above 35°C or in direct sunlight.

Precautions:

Vitavax Dual Powder and Vitaflo Dual Purpose contain thiram. Do not consume alcohol 24 hours before or after working with product or thiram-treated seed.

Comments:

Vitavax Dual Solution may damage painted surfaces by removing paint or leaving stain.

Hazard Rating:

Vitavax Dual Solution - Warning Poison

Vitavax Dual Powder - Danger Poison

Vitaflo Dual Purpose - Danger Poison

Vitavax Powder/Vitaflo-280/Anchor

Company:

Gustafson

Formulation:

Vitavax Powder - 26.7 percent carbathiin and 38.8 percent thiram formulated as powder. Container size - 1.5 kg.

Vitaflo-280 - 14.9 percent carbathiin and 13.2 percent thiram formulated as a suspension. Container sizes - 10 L, 200 L.

Anchor - 66.7 g/L carbathiin and 66.7 g/L thiram formulated as a suspension. Container sizes - 0.9 L, 5 L.

Crops:

Vitavax Powder - Oats, barley, wheat, rye, flax, soybeans, bromegrass.

Vitaflo-280 - Oats, barley, wheat, rye, triticale, flax, soybeans, dry beans, corn, peas, lentils.

Anchor - Soybeans.

Diseases Controlled:

Seed-borne seed rots and seedling blights are generally reduced. See also Cereals and Special Crops tables on page 251.

Crop Stage:

Seed treatment only.

How it Works:

The active ingredient carbathiin has systemic activity. The active ingredient thiram is a dithiocarbamate fungicide with contact activity.

Cost:

$36.00/kg (Vitavax Powder)
$20.10/L (Vitaflo-280)
(1999 suggested retail prices).

Application:

Vitaflo-280 can be diluted with water for use in slurry treaters. Dilute Vitaflo-280 as required to apply the specified rate of undiluted Vitaflo-280. Specific directions regarding dilution are contained in the Vitaflo-280 Operating Manual. Vitaflo-280 Operating Manual is available from your local Vitaflo dealer or by writing Uniroyal Chemical Elmira, Ontario. Agitate while diluting and continue agitating for approximately two minutes after diluting. Keep in constant agitation and use within 24 hours of diluting. DO NOT USE SLURRY TREATMENT FOR FLAX.

Vitaflo-280 should be used undiluted in all commercial seed treaters other than slurry treaters. Treater calibration should be rechecked if the Vitaflo-280 temperature falls below -18°C. Undiluted Vitaflo-280 can be used at temperatures down to -30°C.

Tank Mixes:

Mixing of Vitaflo-280 with solvent based products may result in gelling or sedimentation. Seed treater lines and reservoirs should be thoroughly cleaned before use of Vitaflo-280. To clean, flush with water containing detergent.

Compatibility with Rhizobia Inoculum:

Vitaflo 280 is compatible with rhizobia. Do not tank mix Vitaflo 280 and rhizobia. However, rhizobia and Vitaflo 280 can either be simultaneously applied to the seed through separate delivery systems or applied sequentially. Always check with your rhizobia manufacturers on any restrictions that may exist when used with seed treatment.

Cereals:

PRODUCT	WHEAT	BARLEY	OATS	RYE	TRITICALE
Vitavax Powder	Loose smut Stinking smut (bunt)	False loose smut True loose smut Covered smut	Loose smut Covered smut	Stem smut Seed decay Damping off	
Vitaflo-280	Loose smut, Seed rot, Seedling blight Stinking smut (bunt)	False loose smut True loose smut Covered smut Seed rot Seedling blight Suppression of: Net Blotch	Loose smut Covered smut Seed rot Seedling blight	Seed decay Damping off Seedling blight Seed rot Seedling blight	Damping off Seedling blight Seed decay

Special Crops:

PRODUCT	FLAX	SOYBEANS	DRY BEANS	CORN	LENTILS, PEAS
Vitavax Powder	Damping off Seed decay	Damping off Seed decay			
Vitaflo-280	Damping off Seed decay	Damping off Seed decay	Damping off Seed decay	Damping off Seed decay Seed-borne head smut	Damping off Seed decay
Anchor		Penicillium and Aspergillus storage moulds seed decay seedling blights/seed rots			

Rates:

SEED TYPE/QUANTITY	VITAVAX (KG)	VITAFLO-280 (L)	ANCHOR (L)
Wheat/25 kg seed	0.04 to 0.055	0.057 to 0.082	
Barley/25 kg seed	0.05	0.057 to 0.082	
Oats/25 kg seed	0.07	0.082	
Rye/25 kg seed	0.045	0.057 to 0.082	
Triticale/25 kg seed		0.05	
Flax/25 kg seed	0.06	0.131	
Soybeans/25 kg seed	0.065	0.065	0.15
Dry beans/25 kg seed		0.065	
Corn/25 kg seed		0.07	
Corn head smut/25 kg seed		0.14 to 0.187	
Peas/25 kg seed		0.082 L	
Lentils/25 kg seed		0.082 L	

Restrictions:

Grazing: Do not graze or feed livestock on treated area for 4 weeks after planting. Do not use treated seed for feed, food or oil processing.

Storage: Store powder in a dry place. Do not store seed treated with Vitavax powder. Do not store Anchor in direct sunlight, above 35°C or below 0°C. Do not store seed treated with Anchor. Do not store Vitaflo-280 in direct sunlight or above 35°C. Vitaflo-280 will not freeze even at extreme temperatures. Do not store dry beans or soybeans treated with Vitaflo-280. See label for other treated seed storage restrictions.

Precautions:

Avoid drinking alcohol 24 hours before or after handling product or treated seed.

Comments:

Do not apply Anchor through commercial seed treating equipment or through an auger, as excessive seed wetness may result.

Anchor will perform as a sticker for inoculum applied to soybeans.

Hazard Rating:

Warning Poison

Vitavax RS Flowable/ Vitavax RS Dynaseal/Cloak

Company:

Gustafson

Formulation:

Vitavax RS Flowable - 45 g/L carbathiin, 90 g/L thiram, 680 g/L lindane formulated as a suspension. Container sizes - 4 L, 100 L , 1000 L.

Vitavax RS Dynaseal - 40 g/L carbathiin, 80 g/L thiram, 600 g/L lindane formulated as a flowable suspension. Container size - 100 L.

Cloak - 45 g/L carbathiin, 90 g/L thiram and 533 g/L lindane formulated as a flowable suspension. Container sizes - 100 L, 1000 L.

Crops:

Canola (rapeseed) and mustard.

Vitavax RS Flowable and Cloak are also registered on cole crops.

Diseases Controlled:

CANOLA (RAPESEED)	MUSTARD
Seed decay Preemergence damping off Seed-borne blackleg	Seed decay Preemergence damping off

Insects Controlled:

Flea beetles.

Crop Stage:

Seed treatment only.

How it Works:

The active ingredient carbathiin has systemic activity. The active ingredient thiram is a dithiocarbamate fungicide with contact activity. The active ingredient lindane is an organochlorine insecticide with contact and stomach activity.

Cost:

Vitavax RS Flowable - $40.05 per 25 kg of seed.
Cloak - $32.08 per 25 kg of seed.
Vitavax RS Dynaseal - $39.15 per 25 kg of seed
(1999 suggested retail prices).

Rate:

CHEMICAL	RATE/25 KG SEED	KILOGRAMS OF SEED TREATED per 100 L CONTAINER
Vitavax RS Flowable	0.562 L	4,444 kg
Cloak	0.562 L	4,444 kg
Vitavax RS Dynaseal	0.625 L	4,000 kg

Water Volume:

Not applicable.

Tank Mixes:

Not applicable.

Restrictions:

Environmental: Do not contaminate ponds, lakes or streams.

Grazing: Do not use treated seed for feed, food or oil processing. Do not contaminate feed or foodstuffs. Do not graze or feed livestock on treated areas for 4 weeks after planting. Treated seed must be labelled as follows: **"This seed has been treated with Vitavax RS Flowable or Dynaseal or Cloak (contains carbathiin, thiram and lindane). Do not use for feed or oil processing."**

Storage: Keep flowables above 10°C prior to and during application. Keep away from direct heat. Do not store seed treated with Flowable, Dynaseal or Cloak above 25°C or in direct sunlight. Seed treated with Flowable should have germination retested if stored for periods in excess of 9 months. Do not store cole crop seed that has been treated. Leftover seed should be double-seeded around headland or buried away from water source.

Precautions:

Do not consume alcohol 24 hours before or after working with fungicide containing thiram or the treated seed.

Hazard Rating:

Danger Poison

Vitavax Single Solution

Company:

Gustafson

Formulation:

230 g/L carbathiin formulated as a solution.
Container sizes - 10 L, 200 L.

Crops:

Barley, wheat, oats, rye, flax.

Crop Stage:

Seed treatment.

How it Works:

The active ingredient carbathiin has systemic activity.

Cost:

Cost to treat 25 kg of seed:
$1.40 to 1.73 (wheat)
$1.40 to 1.73 (barley)
$1.40 (oats)
$1.40 (rye)
$2.33 (flax)
(1999 suggested retail prices).

Diseases Controlled:

Seed-borne seed rots and seedling blights.

BARLEY	WHEAT	OATS	RYE	FLAX
Covered smut True loose smut False loose smut Seed rot Seedling blight *Suppression of net blotch, leaf stripe, common root rot	Loose smut Seed rot Seedling blight Stinking smut (bunt) *Suppression of common root rot	Covered smut Loose smut Seed rot Seedling blight *Suppression of common root rot	Stem smut Seed rot Seedling blight *Suppression of common root rot	Seed decay Damping off

* will not protect plants from infection beyond the first leaf stage

Rate:

CROP	L/25 KG SEED	KG SEED TREATED/ 10 L CONTAINER
Wheat**	0.06 to 0.075	4,166 to 3,333
Barley**	0.06 to 0.075	4,166 to 3,333
Oats	0.06	4,166
Rye	0.06	4,166
Flax	0.1	2,500

** For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 75 mL rate will give increased disease control.

Water Volume:

Do not dilute with water.

Tank Mixes:

None.

Restrictions:

Grazing: Do not graze or feed livestock on treated areas for 4 weeks after planting. Do not use treated seed for feed, food or oil processing. Treated seed must be labelled as followed: **"This seed has been treated with Vitavax Single Solution Seed Protectant. Contains carbathiin; do not use for food, feed or oil processing."** Do not contaminate feed or foodstuffs.

Storage: Do not store below 0°C. Product is flammable. Keep away from flame and sparks.

Environmental: Do not contaminate ponds, lakes or streams.

Comments:

Product may damage painted surfaces by removing paint or leaving stain.

Do not use rubber or PVC hose.

Insect Control

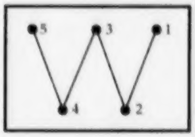
Field Scouting

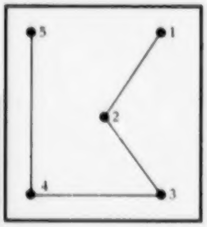
Field scouting is the regular examination of fields to accurately assess the kind and the number of insects present and the amount of damage being done. Scouting should be done weekly during the growing season and daily when infestations approach economic levels or when weather conditions favour the rapid development of specific pests.

To properly scout for insect pests, you must know when they occur, where they live, what they look like, and how to find and count them. Generally, in fields of less than 100 acres, check a minimum of five locations. In fields greater than 100 acres, check a minimum of 10 locations. There are several possible scouting patterns that can be used when checking fields. These options are based on pest distribution and field configuration.

Pattern 1: Used when pests are uniformly distributed.

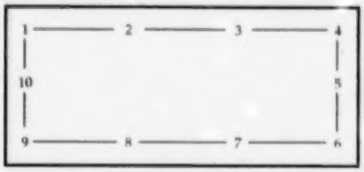
This scouting pattern typically looks like an X, Z or W, excluding field edges. Pests that fit this pattern include aphids, bertha armyworm, diamondback moth, lygus bugs.





Pattern 2: Used when pests are at the edges of fields.

Scout by walking along field edges, fence lines or ditches. Some examples of pests appearing at the edges of fields include flea beetles, colorado potato beetles and grasshoppers.



The following table outlines monitoring methods, typical symptoms and **economic thresholds** for the more common crop pests. The economic threshold is the minimum number of insects or damage to the crop where the cost of an insecticide or control measure is less than the yield loss if the control is not used. Note that factors such as moisture, temperature conditions and stage of crop growth, can increase or decrease the impact of insects on crop production.

Field Monitoring and Economic Thresholds for Insects

INSECT	CROP	WHEN AND HOW TO MONITOR	TYPICAL DAMAGE	ECONOMIC THRESHOLD
Aphids	Cereals	- July through early August - check 10 plants at each stop - record total number of aphids and calculate average per plant	Visible wilting of plants, yellow patches in fields, plants are sticky	12-15 aphids/ stem until about 2 weeks after flowering
	Peas	- July when crop flowers - check 10, 8 inch (20 cm) plant tips at each stop - record total number of aphids and calculate average per plant tip		2-3 aphids per 8 inch (20 cm) plant tip when 50 percent of plants have produced some young pods
	Alfalfa	- July through August - take 5 sweeps at each location - record total number of aphids and calculate average per sweep	Wilting of plants, plants are sticky	200 aphids/ sweep
	Flax	- mid-July to mid-August - check 10 plants at each stop - record total number of aphids and calculate average per plant	Wilting of plants, plants are sticky	3 or more aphids per main stem at full flower or 8 or more aphids per main stem at green boll stage

INSECT	CROP	WHEN AND HOW TO MONITOR	TYPICAL DAMAGE	ACTION THRESHOLD
Armyworms	Cereals	- mid-June through July - at each stop shake plants in 1 yard^2 (m^2) area and carefully check soil surface for dislodged larvae	Leaves stripped from plants, awns chewed from heads, heads clipped	10 larvae/yard^2 (m^2)
Bertha armyworms	Canola	- late July through early August - at each stop, shake plants in 1 yard^2 (m^2) area and carefully check soil surface for dislodged larvae - during heat of the day larvae will often be found under leaves on soil surface	Outer layers of stems and pods chewed resulting in whitish appearance, holes chewed in pods	10 to 34 larvae/yard^2 (m^2), depending on value of crop and cost of control.
Cutworms	All crops	- late May through mid-July - at each stop, check several 1 yard^2 (m^2) areas. Use trowel or shovel to carefully search through top half to 1 inch of soil for cutworm larvae	Plants cut off at or near soil surface, some leaf feeding above ground, plants missing from rows, bare patches appearing in field	3-4/yard^2 (m^2)
	Corn	- at each stop, examine 100 plants in a row - calculate percentage of plants cut off or showing leaf feeding		When 3 percent of plants are cut
	Sunflowers	- at each stop, examine 100 plants in a row		1 per foot^2 or when stand reduction exceeds 25-30 percent
Diamondback moths	Canola	- July through early August - examine 10 plants at each stop and calculate average per plant	Flowers clipped or chewed, outer layers of stem and pods chewed, holes chewed in pods	30 larvae/foot^2
European corn borers	Corn	- at each stop, examine 10 plants for egg masses and signs of shot-holing - calculate percentage of plants with shot-holes	Shot-holes in leaves, holes in stalk, tassels and ears	When 50% of the plants have shot-holes in the leaves, caused by young corn borers

INSECT	CROP	WHEN AND HOW TO MONITOR	TYPICAL DAMAGE	ACTION THRESHOLD
Flea beetles	Canola	- May through June when crop is in seedling stage - examine 10 plants at random at each stop - estimate overall percentage leaf loss	Shot-holes in leaves, complete destruction of seedling plants late May through June. Holes chewed in pods in August (occasional)	When 25 percent of leaf surface is destroyed
Grasshoppers	All crops	- May through July - check along edges of crop, particularly areas adjacent to hayland and pastures - estimate number of hoppers/yard^2 (m^2)	Black strips along margins of newly emerging crops, head clipping later in season	When populations exceed 8 to 12/yard^2 (m^2). At flowering and podding stage of lentils the threshold is 2/m^2.
Lygus bugs	Canola	- Scout from just prior to bud formation until seeds within the pod have become firm. - make 10 180° sweeps with a 37 cm diameter insect net at each sampling site.	Attacked buds appear shrunken and bleached white. damaged seeds appear dark brown and shrivelled.	10-18 lygus bugs/10 sweeps from the end of flowering to early pod development in the upper canopy, and 15-25 lygus bugs/10 sweeps in early pod ripening stage.
Lygus bugs, plant bugs	Seed alfalfa	- June through mid-August - make five 180° sweeps with a 15 inch (40 cm) insect net through alfalfa canopy at each sampling site - record total number of plant and lygus bugs (both nymphs and adults) captured - calculate average number per sweep	Field blooms poorly or not at all, flowers drop prematurely, collapsed seed	4 to 5 plant or lygus bugs/sweep at bud stage and 8 to 10/sweep at seed stage
Sunflower beetles	Sunflowers	**Adults** - May through early June on seedling plants - examine 10 plants at random at each stop	Leaves of seedling plants chewed or completely destroyed late May through June, shot-holes or large areas of leaves chewed July through August	1 adult beetle per two seedling plants

INSECT	CROP	WHEN AND HOW TO MONITOR	TYPICAL DAMAGE	ACTION THRESHOLD
Sunflower beetles (con'td.)		**Larvae** - July through mid-August - examine 10 plants at random at each sampling site - peel back leaves around growing tip and record total number of larvae found - calculate average number per plant	Leaves of plants chewed or completely destroyed	10 to 15/plant
Sunflower seed weevil	Sunflower - confectionery	- examine fields when ray petals begin to form and continue every 2 to 3 days until pollination is complete - examine 5 plants at each stop - brush heads vigorously to bring weevils to surface - record total number of weevils and calculate average per head	Seeds partly or completely destroyed, exit hole in hull Shrivelled kernels, kernels completely destroyed	1 to 2 weevils/head
	Oil seed			12 to 14 weevils/head
Wheat midge	Wheat	- July when crop emerges from boot stage until flowering - check crop canopy at dusk for signs of wheat midge adult activity - at each stop, examine 10 heads - record the number of midge adults observed on or near heads - calculate average number of midge per head		1 adult midge per 4 to 5 heads

Additional information on insect biology, monitoring, and control can be found on the Manitoba Agriculture and Food Internet site at http://www.gov.mb.ca/agriculture and on the Saskatchewan Agriculture and Food Internet site at http://www.agr.gov.sk.ca

Insect Control Decisions

Control of insects should be considered when numbers or damage exceed economic thresholds (when yield loss is greater in value than the cost of the control and its application). To select an insecticide, verify the registered products in Table 1 (p. 205) for the insect and field crop. Consideration should then be given to the rates, cost and preharvest intervals, the product application, restrictions, precautions and the hazard rating. The preharvest interval is the number of days that must pass between application and swathing or harvesting.

Degree of Risk and Hazard Rating:

(see page 7 and 8 for full description)

Danger poison: LD_{50} is less than 500 mg/kg and indicates high toxicity.

Warning poison: LD_{50} is between 500-1,000 mg/kg and indicates moderate toxicity.

Caution poison: LD_{50} is between 1,000-2,500 mg/kg and indicates low toxicity.

(LD_{50} values are used to rate the toxicity of pesticides. They refer to the dose of pesticide (in mg per kg) that is lethal to 50 percent of a test animal population).

Insecticides and Bees

All insecticides listed in the Guide are poisonous to bees and other pollinating insects. There are a number of common sense steps that should be taken to avoid accidental poisoning of bee colonies:

- Do not apply any insecticides to flowering crops during the time of day when bees are active.
- If it is necessary to spray a crop where honey bees are foraging, do so early in the morning or late evening when bees are not active.
- Contact the beekeeper at least 48 hours before insecticide application if bee colonies are near the field to be treated.
- Communication between growers, commercial pesticide applicators and beekeepers is still the most effective strategy for avoiding bee poisoning.

The following table indicates the maximum time required for the insecticides listed in the Guide to be degraded by weather to a low hazard level for bees. **These times are to be used as general guidelines only.** Most of these insecticides have not been tested for bee toxicity under western Canadian conditions and environmental conditions influence the rate at which pesticides degrade.

Field Hazard of Insecticides to Bees

INSECTICIDE	TOXICITY RATING		[a]RESIDUE HAZARD (DAYS)
	HONEY BEE	LEAFCUTTER BEE	
Ambush	1	1	5
Cygon	1	1	7
Cymbush	–[b]	–[b]	–[b]
Decis	2	2	1
Dylox	2	2	0.5
Endosulfan	2	1	2
Furadan 480F	1	1	5
Guthion	1	1	5
Lagon	1	1	7
Lannate	1	1	1.5
Lorsban	1	1	3.5
Malathion	2	1	2 (Honey Bee), 6 (Leafcutter Bee)
Matador	2	2	1
Metasystox-R	2	2	0.5
Monitor	1	1	1
Pirimor	2	2	0.5
Pounce	1	1	5
Pyrinex	1	1	3.5
Ripcord	–[b]	–[b]	–[b]
Sevin	1	1	7
Sniper	1	1	5
Thiodan/Thionex	2	1	2

TOXICITY RATING 1 = High 2 = Moderate 3 = Low

[a] Residue hazard represents the average time in days that residues poisonous to bees will remain on foliage. Most of this information has not been generated under western Canadian growing conditions and should be used only as a guideline.

[b] Information currently not available, although these products are known to be toxic to bees.

Resistance of Insects to Insecticides

Repeated use of the same or similar insecticides against a particular insect in a given area may result in the effectiveness of the insecticide being reduced. To retard or prevent resistance of insects to insecticides, use insecticides only when the economic threshold for a pest has been surpassed and natural controls fail to limit economic damage, and rotate between insecticides with different chemical structures, particularly if several applications are made in a season.

Insecticides can be classified according to their similarity in chemical structure (chemical family in the table below), and by mode of action (the process by which the insecticide kills the insect). By selecting products from different chemical families (i.e. with different chemical structures) for an insecticide rotation program, insecticide resistance can be prevented.

CHEMICAL FAMILY	TRADE NAME	COMMON NAME	MODE OF ENTRY
CARBAMATES	Sevin, Ecobait	carbaryl	contact/stomach
	Furadan	carbofuran	contact/systemic
	Lannate	methomyl	contact/stomach
	Pirimor	pirimicarb	contact vapour/systemic
ORGANOPHOSPHATES	Guthion, Sniper	azinphos-methyl	contact
	Cygon, Lagon, Hopper Stopper	dimethoate	contact/systemic
	Malathion, Fyfanon	malathion	contact
	Lorsban, Pyrinex	chlorpyrifos	contact/stomach/inhalation
	Monitor	methamidophos	contact/systemic
	Di-Syston	disulfoton	systemic
	Counter	terbufos	systemic
	Thimet	phorate	systemic
	Dyfonate	fonofos	ingestion/systemic
	Orthene	acephate	contact/stomach/systemic
	Diazinon	diazinon	contact/stomach
	Dylox	trichlorfon	contact/stomach
ORGANOCHLORINES	Endosulfan, Thiodan Thionex	endosulfan	contact/stomach
	Lindane	gamma BHC	contact/stomach
PYRETHROIDS	Cymbush, Ripcord	cypermethrin	contact/stomach
	Decis	deltamethrin	contact/stomach
	Ambush, Pounce	permethrin	contact/stomach
	Matador	cyhalothrin-lambda	contact/stomach
BIOLOGICALS	Novodor	*B.t. tenebrionis*	ingestion
	Dipel	*B.t.* ssp. kurstaki	stomach
Chloronicotinyls	Admire	imidacloprid	contact/stomach

Insecticide Selector Chart

BEETLES (COLEOPTERA)

	Alfalfa Weevil	Blister beetle	Colorado potato beetle	Flea beetles	Red turnip beetle
Barley					
Oats					
Rye					
Wheat					
Canola				Counter 5G Decis Guthion Malathion Matador Sevin Cymbush Furadan Sniper Fyfanon Ripcord Lindane[s]	Furadan Guthion Sniper
Flax					
Sunflowers					
Mustard				Counter 5G Decis Matador Fyfanon Cymbush Furadan Lindane[s]	Furadan
Alfalfa	Decis Fyfanon Guthion Malathion Matador Sniper	Sevin			
Corn					
Potatoes			Admire **Cymbush *Decis Guthion *Pyrinex *Matador Pounce Sevin Thiodan Sniper Diazinon Ambush Di-Syston Furadan *Lorsban Malathion Monitor **Ripcord Thimet Endosulfan Fyfanon	Ambush *Decis Furadan *Lorsban *Matador Pounce Sevin Guthion Endosulfan Orthene **Cymbush Di-Syston *Lannate *Pyrinex Monitor **Ripcord Thimet Thiodan Sniper Diazinon	
Sweet clover		Sevin			
Beans					

[s] Seed treatment
*Not an approved product by Midwest Food Products Inc.
**Not an approved product by Midwest Food Products Inc. and McCain Foods.

BEETLES (COLEOPTERA)				
	Sunflower beetle	**Sunflower seed weevil**	**Sweet clover weevil**	**Wireworm**
Barley				Lindane[a]
Oats				Lindane[a]
Rye				Lindane[a]
Wheat				Lindane[a]
Canola				
Flax				
Sunflowers	Cymbush Decis Furadan Guthion Sniper Matador Ripcord Thiodan	Cymbush Lorsban Ripcord		
Mustard				
Alfalfa			Cygon Sniper Guthion	
Corn				Counter 15G Lindane[a]
Lentils				
Peas				
Potatoes				Thimet
Sweet clover			Cygon Lagon Guthion Sniper Malathion Fyfanon	
Canary seed				
Hay				
Beans				

[a] Seed treatment

MOTHS AND BUTTERFLIES (LEPIDOPTERA)

	Beet Webworm	Bertha armyworm	Clover Cutworm	Diamondback moth	Redbacked cutworm
Barley					Ambush Decis Lorsban Pounce Pyrinex Ripcord
Oats					Ambush Decis Lorsban Pounce Pyrinex
Rye					Ambush Pounce
Wheat					Ambush Decis Lorsban Pounce Pyrinex Ripcord
Canola	Decis Dylox Lannate	Cymbush Decis Lannate Lorsban Monitor Ripcord Pyrinex	Decis Lannate	Decis Dylox Guthion Sniper Lorsban Pyrinex Malathion Fyfanon	Ambush Pounce Lorsban Pyrinex
Flax	Decis Dylox	Lannate Lorsban Dylox	Decis		Ambush Pounce Decis Lorsban Pyrinex
Sunflowers					Ambush Lorsban Pyrinex Pounce
Mustard	Decis	Cymbush Decis	Decis	Decis	
Alfalfa	Sevin				
Corn					Ambush Lorsban Pyrinex Pounce Ripcord Dylox Matador
Lentils					Ambush Pounce Decis
Peas					Ambush Pounce
Potatoes					Ambush Pounce *Lorsban *Pyrinex **Ripcord
Sweet clover	Sevin				
Timothy					
Canary seed					
Beans					

*Not an approved product by Midwest Food Products Inc.

**Not an approved product by Midwest Food Products Inc. and McCain Foods.

MOTHS AND BUTTERFLIES (LEPIDOPTERA)

	European corn borer	European skipper	Sunflower moth	True armyworm
Barley				Dylox Lorsban Malathion Sevin Lannate Pyrinex Fyfanon
Oats				Dylox Lorsban Malathion Sevin Lannate Pyrinex Fyfanon
Rye				Malathion Sevin Fyfanon
Wheat				Dylox Lorsban Malathion Sevin Lannate Pyrinex Fyfanon
Canola				Lorsban Pyrinex
Flax				Lorsban Dylox
Sunflowers			Dipel	
Mustard				
Alfalfa				Sevin
Corn	Cymbush Furadan Sevin Pounce Fyfanon Decis Ripcord Ambush Lannate Matador			Dylox
Lentils				
Peas				
Potatoes	Guthion Sevin Sniper			
Sweet clover				
Timothy		Dipel		
Canary seed				
Beans				

FLIES AND GRASSHOPPERS

	Alfalfa blotch leafminer	Hessian fly	Root maggot	Wheat midge	Grasshopper		
Barley					Decis Lorsban Matador Hopper Stopper	Guthion Pyrinex Ripcord Lagon	Sniper Malathion Sevin Ecobait
Oats					Decis Lorsban Matador Hopper Stopper	Guthion Pyrinex Sevin Ecobait	Sniper Malathion Lagon
Rye					Lagon Malathion Hopper Stopper	Guthion Sevin Ecobait	Sniper
Wheat		Di-Syston 15G (winter wheat only)		Lorsban Pyrinex Cygon Lagon	Decis Lagon Malathion Hopper Stopper	Guthion Lorsban Matador Sevin	Sniper Pyrinex Ripcord Ecobait
Canola			Counter 5G		Lagon Malathion Monitor Ecobait	Lorsban Fyfanon Ripcord	Pyrinex Matador Cygon
Flax					Decis Fyfanon	Malathion Matador	
Mustard			Counter 5G		Matador	Fyfanon	
Alfalfa	Cygon Fyfanon Lagon				Cygon Sniper Hopper Stopper Ecobait	Lagon Malathion Sevin	Guthion Fyfanon Matador
Corn					Hopper Stopper	Sevin	Ecobait
Lentils					Lorsban Fyfanon	Malathion Decis	
Pastures					Cygon Malathion Hopper Stopper	Lagon Matador Ecobait	Decis Sevin Diazinon
Headlands					Ripcord Hopper Stopper	Sevin Lagon	Cygon Ecobait
Roadsides					Decis Hopper Stopper Ecobait	Ripcord Cygon Diazinon	Sevin Lagon
Sweet clover					Guthion Hopper Stopper	Sniper Lagon	Sevin
Hay					Malathion Lagon	Hopper Stopper	
Beans					Lagon	Ecobait	

SUCKING BUGS

	Aphids	Leafhoppers	Lygus bugs	Thrips
Barley	Di-Syston Malathion Lorsban Pyrinex Fyfanon			Cygon Lagon Lannate
Oats	Di-Syston Malathion Fyfanon			Cygon Lagon Lannate
Rye	Malathion Fyfanon			
Wheat	Lagon Malathion Lorsban Pyrinex Fyfanon			Cygon Lagon Lannate
Canola	Cygon Lagon	Cygon Lagon	Dylox Lorsban Matador	
Flax	Cygon Lagon			
Alfalfa	Cygon Lagon Guthion Sniper Malathion Fyfanon Matador	Cygon Lagon Sevin Malathion Guthion Sniper Fyfanon Matador	Cygon Lagon Decis Dylox Guthion Sniper Malathion Fyfanon Matador	
Corn	Lannate Pirimor Endosulfan Thiodan			
Beans	Cygon Lagon Di-Syston Guthion Sniper Malathion Fyfanon Thimet Thiodan Diazinon	Cygon Lagon Guthion Sniper Malathion Fyfanon Sevin Thiodan Thimet Di-Syston Diazinon	Cygon Lagon Dylox Sevin Thimet	
Peas	Cygon Lagon Di-Syston Lannate Malathion Pirimor Thiodan Fyfanon	Fyfanon		
Potatoes	Cygon Lagon Di-Syston Guthion *Lannate Malathion Monitor **Pirimor Thimet Sniper Thiodan Endosulfan Fyfanon Orthene Diazinon	Ambush Cygon Lagon **Cymbush *Decis Thimet Di-Syston Furadan *Lannate Malathion *Matador Monitor Pounce **Ripcord Sevin Thiodan Guthion Sniper Endosulfan Orthene Fyfanon Diazinon	Ambush Lagon **Cymbush *Decis Furadan Guthion Sniper *Lorsban *Pyrinex *Matador Pounce **Ripcord Thiodan WP Endosulfan W Sevin Orthene	
Sweet clover	Guthion Sniper Cygon	Cygon Sniper Sevin	Cygon Guthion Sniper	
Canary seed	Cygon Lagon Malathion			

*Not an approved product by Midwest Food Products Inc.

**Not an approved product by Midwest Food Products Inc. and McCain Foods.

Insecticide Directory

Admire

Company:

Bayer Inc.

Formulation:

240 g/L imidacloprid formulated as a flowable

Insects Controlled and Registered Crops:

CROP	INSECT
Potato	Colorado potato beetle

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Colorado potato beetle	Foliar application: 0.08 L / acre Soil Application: 7.5 to 12 ml / 100m row or 0.344 – 0.526 L/acre based on 90 cm row spacing	$18.80 $80.84 - $123.61 /acre	7 days

Application:

Do not apply by aerial application.

Soil application: For best results, direct spray on the seed pieces or seed potatoes in the furrow. The higher rate is recommended when extended length of control is needed. Do not follow a soil application with a foliar application.

Foliar application: A maximum of two foliar applications of Admire may be made per season.

How it Works:

Admire is a systemic, chloronicotinyl insecticide.

Restrictions:

Do not apply within 15 meters of well-heads or aquatic systems, including marshes, ponds, ditches, streams, lakes, etc. Do not apply through any type of irrigation system.

Precautions:

Do not re-enter treated areas for 24 hours after foliar application of Admire. Admire is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Highly toxic to aquatic invertebrates and birds.

Hazard Rating:

Caution Poison

Ambush/Pounce

Company:

Ambush - Zeneca Agro

Pounce - United Agri Products

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulations:

Ambush - 500 g/L permethrin formulated as an emulsifiable concentrate. Container size - 1 L (6 x 1L).

Pounce - 384 g/L permethrin formulated as an emulsifiable concentrate. Container size - 1 L (10 x 1L).

Insects Controlled and Registered Crops:

CROP	INSECT
Cereals, canola, corn, flax, lentils, peas, potatoes, sunflowers,	Redbacked cutworm, Pale Western cutworm European corn borer, corn earworm, Fall armyworm
Potatoes	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug, variegated cutworm

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Redbacked cutworm			
(Ambush)	0.06 - 0.12 L/acre	$6.58 - $13.16/acre	Treat prior to 6-leaf stage
(Pounce)	0.075 - 0.158 L/acre	$6.75 - $14.22/acre	
Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug			
(Ambush)	0.06 - 0.08 L/acre	$6.58 - $8.78/acre	1 day
(Pounce)	0.075 - 0.10 L/acre	$6.75 - $9.00/acre	1 day
Variegated cutworm			
(Ambush)	0.06 L/acre	$6.58/acre	1 day
(Pounce)	0.075 L/acre	$6.75/acre	
European corn borer, corn earworm			
(Ambush)	0.08 - 0.11 L/acre	$8.78 - $12.07/acre	1 day
(Pounce)	0.11 - 0.15 L/acre	$9.90 - $13.50/acre	
Fall Armyworm			
(Ambush)	0.06 L/acre	$6.58/acre	1 day
(Pounce)	0.073 L/acre	$6.57/acre	

Application:

Apply Ambush for cutworm control by ground only. Foliar potato pests may be controlled by air or ground. Apply Pounce by ground only. Apply when insects exceed economic threshold numbers and use sufficient water for good coverage. Use higher rates for heavy infestations, adult insects and dense foliage. For cutworm control application should be made under warm, moist conditions in the evening or at night. Use high rates if larvae are near maturity or soil conditions are dry. Do not disturb soil surface for five days after treatment.

How it works:

A synthetic pyrethroid insecticide. It is a stomach and contact insecticide with no systemic or fumigant effects.

Restrictions:

Grazing: Cover crops or crops treated with Ambush/Pounce should not be used as a green feed for animals.

Storage: Store above 0°C.

Others: Observe a 16 yard (15 m) setback distance for ground and 110 yard (100 m) setback distance by air near water bodies or other sensitive areas.

Precautions:

Ambush/Pounce are of low acute mammalian toxicity. Both are very toxic to bees and fish. Do not contaminate ponds, lakes or streams while filling sprayer or spraying. Avoid spraying when bees are foraging.

Hazard Rating:

Caution Poison

Counter

Company:

Cyanamid Crop Protection

Formulations:

5 percent and 15 percent terbufos formulated as a granular.

Container sizes - 20 kg (5 percent); 20 kg (15 percent).

Insects Controlled and Registered Crops:

CROP	INSECT
Canola, mustard (Counter 5G)	Flea beetles, cabbage root maggot suppression
Field corn, sweet corn (Counter 15G)	Wireworm, seed corn maggot

Rates and Costs:

INSECT	RATE	COST
Flea beetle (Counter 5G)	2.2 - 4.5 kg/acre	N/A*
Root maggots (Counter 5G)	2.2 - 4.5 kg/acre	N/A*
Seed corn maggot, wireworms (Counter 15G)	0.075 kg/110 yard (100 m) row (minimum 2.5 feet (75 cm) row spacing)	$0.38/110 yard (100 m) row (minimum 2.5 feet (75 cm) row spacing)

*Counter 5G is sold with seed.

Application:

For control of flea beetles or suppression of root maggots in canola and mustard at planting time, blend seed and granules in a mechanical mixer or stir with a stick in the drill box. Mix 2.2-4.5 kg Counter 5G with enough seed to sow 1 acre. Adjust the flow rate to sow the combined weight of seed and Counter 5G.

Example: If 2.2 kg of seed per acre is to be sown, mix with 2.2 kg of Counter 5G, adjusting seeding rate to sow 4.4 kg per acre.

To reduce root maggot feeding damage in canola, mix 2.2 to 4.5 kg Counter 5G with enough seed to sow 1 acre. Adjust the flow rate to sow the combined weight of seed and Counter 5G.

For control of seed corn maggot and wireworms in corn, place granules in a 7 inch (18 cm) band over the row directly behind planter shoe or place directly into the seed furrow behind the planter shoe. Works as a systemic poison with good initial and residual activity.

Use higher rates of Counter 5G when extreme infestations of flea beetles or root maggots are anticipated.

Counter 5G can be effectively used with air seeders provided that the seed is placed in rows. If the seed emerges in rows then Counter 5G will continue to be effective. When the seed is widely distributed with a broadcast boot under a wide sweep, Counter 5G will not provide adequate control.

Counter 5G may be mixed with fungicide treated seed.

How it works:

Counter is a systemic, organophosphorous insecticide with effective initial and residual activity.

Restrictions:

Storage: Store away from food and feed. Store open bags in labelled sealed drums or heavy plastic bags.

Others: Treated seed must not be used for feed or oil processing. Excess treated seed should be used up by double planting.

Do not reuse the bag. Completely empty the bag, make the empty bag unsuitable for further use, dispose of bag in accordance with provincial requirements.

Precautions:

Counter has a high acute mammalian toxicity. Very highly toxic to birds, fish and other wildlife. Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning. Do not get in eyes, on skin or clothing. Do not handle with bare hands. Do not breathe in dust. Do not contaminate food or feed products. Wear freshly laundered, long-sleeved work clothing daily. Wear rubber gloves with sleeve cuffs covering the gloves.

Hazard Rating:

Danger Poison

Cygon/Lagon/Hopper Stopper

Company:

Hopper Stopper - Peacock Industries

Cygon - IPCO, Cheminova

Lagon - United Agri Products

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulations:

Cygon/Lagon - 480 g/L dimethoate formulated as an emulsifiable concentrate. Container size - 10 L.

Hopper Stopper - 5.2 percent dimethoate formulated as a bran bait. Container size - 20 kg.

Insects Controlled and Registered Crops:

CROP	INSECT
Beans	Aphids, grasshoppers, leafhoppers, lygus bugs
Potatoes	Aphids, leafhoppers
Alfalfa	Alfalfa blotch leafminer, aphids, grasshoppers, leafhoppers, lygus bug, plant bug
Canary seed	Aphids
Canola	Aphids, grasshoppers, leafhoppers
Pastures, wasteland, forages	Grasshoppers
Wheat	Orange wheat blossom midge, thrips, grasshoppers, Russian wheat aphid
Flax	Aphids
Sweet clover	Sweet clover weevil
Peas	Aphids
Barley, oats	Aphids, grasshoppers, thrips
Rye	Grasshoppers

Rate, Costs, Preharvest Intervals:

Cygon 4-E (IPCO), Cygon 480 (Cheminova)

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids (alfalfa)	0.17 L/acre	$3.87/acre	2 days
Aphids (beans)	0.28 - 0.40 L/acre	$6.37 - $9.10/acre	7 days
Aphids (canary seed)*	0.20 L/acre	$4.55/acre	21 days
Aphids (canola)*	0.34 - 0.36 L/acre	$7.74 - $8.19/acre	21 days
Aphids (peas)	0.11 - 0.17 L/acre	$2.50 - $3.87/acre	3 days
Aphids (potatoes)	0.22 - 0.44 L/acre	$5.01 - $10.01/acre	7 days
Aphids (wheat, oats, barley)*	0.17 L/acre	$3.87/acre	21 days
Potato aphid (flax)*	0.18 L/acre	$4.10/acre	21 days
Leafhoppers (alfalfa)	0.17 L/acre	$3.87/acre	2 days
Leafhoppers (beans)	0.28 - 0.40 L/acre	$6.37 - $9.10/acre	7 days
Leafhoppers (canola)*	0.34 - 0.36 L/acre	$7.74 - $8.19/acre	21 days
Leafhoppers (potatoes)	0.22 - 0.44 L/acre	$5.01 - $10.01/acre	7 days
Grasshoppers (alfalfa, pasture, wasteland)	0.17 - 0.34 L/acre	$3.87 - $7.74/acre	2 - 7 days
Grasshoppers (canola)*	0.34 - 0.36 L/acre	$7.74 - $8.19/acre	21 days
Sweet clover weevil (sweet clover)	0.34 - 0.44 L/acre	$7.74 - $10.01/acre	28 days
Lygus bugs, plant bugs** (alfalfa)	0.17 L/acre	$3.87/acre	2 days
Lygus bugs, plant bugs (alfalfa seed production)*	0.44 L/acre	$10.01/acre	28 days
Lygus bugs (beans)	0.28 - 0.40 L/acre	$6.37 - $9.10/acre	7 days
Alfalfa blotch leafminer*	0.22 L/acre	$5.01/acre	2 days
Wheat midge*	0.40 L/acre	$9.10/acre	21 days
Thrips (wheat, oats, barley)*	0.40 L/acre	$9.10/acre	21 days

*Cygon 480 only
**Cygon 4-E only

Lagon 480E (United Agri Products)

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids (beans)	0.28 - 0.40 L/acre	$5.40 - $7.72/acre	7 days
Aphids (canola)	0.34 - 0.36 L/acre	$6.56 - $6.95/acre	21 days
Aphids (canaryseed)	0.20 L/acre	$3.86/acre	21 days
Aphids (alfalfa)	0.17 L/acre	$3.28/acre	2 days
Aphids (peas)	0.11 - 0.17 L/acre	$2.12 - $3.28/acre	3 days
Aphids (potato)	0.22 - 0.44 L/acre	$4.25 - $8.49/acre	7 days
Potato aphids (flax)	0.17 L/acre	$3.28/acre	21 days
Russian wheat aphid	0.40 L /acre	$7.72/acre	21 days
Grasshopper (alfalfa)	0.22 - 0.36 L/acre	$4.25 - $6.95/acre	2 - 7 days
Grasshopper (beans)	0.28 - 0.40 L/acre	$5.40 - $7.72/acre	7 days
Grasshopper (canola)	0.34 - 0.36 L/acre	$6.56 - $6.95/acre	21 days
Grasshopper (forages)	0.17 - 0.40 L/acre	$3.28 - $7.72/acre	2 - 28 days
Grasshopper (pasture, wasteland)	0.22 - 0.40 L/acre	$4.25 - $7.72/acre	2 - 28 days
Grasshopper (barley, oats, wheat, rye)	0.22 - 0.40 L/acre	$4.25 - $7.72/acre	2 days
Grasshopper (safflower)	0.22 - 0.40 L/acre	$4.25 - $8.49/acre	21 days
Alfalfa blotch leafminer	0.22 L/acre	$4.25 / acre	2 days
Leafhoppers (potato)	0.22 - 0.44 L/acre	$4.25 - $8.49/acre	7 days
Leafhoppers (canola)	0.34 - 0.36 L/acre	$6.56 - $6.95/acre	21 days
Lygus bugs, plant bugs (alfalfa seed)	0.44 L/acre	$8.49/acre	28 days
Orange wheat blossom midge (wheat)	0.40 L/acre	$7.72/acre	21 days
Say stinkbugs (barley, oats, wheat, rye)	0.22 - 0.40 L/acre	$4.25 - $8.49/acre	2 days
Sweet clover weevil	0.34 - 0.44 L/acre	$6.56 - $8.49/acre	28 days
Thrips (barley, oats, wheat)	0.40 L/acre	$7.72/acre	7 days

Application:

May be applied by air or ground equipment. Apply when insects exceed economic threshold numbers and use sufficient water for good coverage. Use higher rates for adult insects, heavy infestations or dense canopy.

How it works:

Broad spectrum, systemic and contact, organophosphate insecticide and acaricide.

Restrictions:

Grazing: Remove cattle prior to spraying. Read label carefully to determine livestock reentry period.

Storage: Store at temperatures between 4°C and 30°C and in areas away from feed and food.

Others: Do not treat when bees are foraging. Do not apply to alfalfa in bloom. Read label carefully to determine maximum number of applications per season. Wait at least 10 days before placing leafcutter bees in treated fields.

Precautions:

Dimethoate is of high acute mammalian toxicity and is highly toxic to birds, bees and other animals. Wear a respirator, goggles, rubber gloves, rubber boots and coveralls when handling concentrate. Avoid contact with skin and eyes. Do not inhale spray mist.

Hopper Stopper Bran Bait (Peacock Industries):

For the control of grasshoppers on pastures, roadsides, forages, cereal crops, and waste areas. For ground or aerial broadcast application.

Apply evenly to control grasshoppers at the rate of 0.8 to 1.2 kg/acre.

When applied as directed will not harm pollinators. May be used on pastures without removing beef cattle. Dairy cattle should be removed for 48 hours. Leave a 21 day interval between last application and harvest of grain.

Hazard Rating:

Warning Poison - Lagon
Caution Poison - Hopper Stopper
Danger Poison - Cygon

Cymbush

Company:

Zeneca Agro

Formulations:

250 g/L cypermethrin formulated as an emulsifiable concentrate.

Container size - 1L jugs.

Insects Controlled and Registered Crops:

CROP	INSECT
Canola, mustard	Flea beetle, bertha armyworm
Corn	European corn borer
Potatoes	Colorado potato beetle, potato flea beetle, potato leaf hopper, tarnished plant bug
Sunflowers	Sunflower beetle, sunflower seed weevil

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Flea beetle (canola, mustard)	0.055 L/acre	$3.49/acre	30 days
Flea beetle (potato)	0.055 L/acre	$3.49/acre	7 days
Bertha armyworm	0.08 - 0.113 L/acre	$5.08 - $7.18/acre	30 days
Colorado potato beetle	0.055 L/acre	$3.49/acre	7 days
European corn borer	0.113 L/acre	$7.18/acre	5 days
Potato leafhopper	0.055 L/acre	$3.49/acre	7 days
Tarnished plant bug	0.08 L/acre	$5.08/acre	7 days
Sunflower beetle, sunflower seed weevil	0.04 L/acre	$2.54/acre	70 days

Application:

May be applied by air or ground equipment, except mustard (ground application only). Apply when insects exceed economic thresholds and use sufficient water for good coverage. Refer to product label for maximum number of ground and aerial applications allowed.

How it Works:

Works as a contact and stomach poison with good residual activity. No systemic or fumigant activity.

Effects of Weather:

Avoid application when temperatures exceed 27°C.

Restrictions:

Grazing: Cover crop or crop treated with Cymbush must not be used as a green feed for animals except as noted for corn, rutabagas, and turnips.

Storage: Store in a cool, dry, well ventilated area away from foodstuffs. This product is not affected by freezing.

Others: Observe a 16 yard (15 m) buffer zone from water bodies by ground application and a 110 yard (100 m) buffer zone from water bodies when applied by air.

Precautions:

Cymbush is of low to moderate mammalian toxicity and is very toxic to bees and fish. Harmful or fatal if swallowed or absorbed through the skin. Causes eye and skin irritation and skin sensitization. Wear long-sleeved clothing and rubber gloves when handling or spraying. Wear face shield or eye goggles when mixing. Do not contaminate ponds, lakes or streams during sprayer filling or while spraying. Avoid spraying when bees are foraging.

Hazard Rating:

Warning Poison

Decis

Company:

AgrEvo Canada Inc.

Formulations:

50 g/L deltamethrin formulated as an emulsifiable concentrate and as a flowable.

Container sizes: Decis 5EC - 2.5 L and 2 L jugs;

Decis 5F - 3 L jugs.

Application:

Decis may be applied by air or ground equipment to all crops with the exception of alfalfa and corn, which require ground application only. Apply when insects exceed economic threshold numbers with sufficient water for good coverage.

Use higher rates for severe infestations, on dense foliage or when a number of insect growth stages are present. Works as contact and stomach poison usually with very quick results.

Tank Mixes:

May be tank mixed with the following herbicides:

Hoe-Grass 284 (5 EC only)
Pardner
Banvel
2,4-D
Achieve (Decis 5F only)
Hoe-Grass II (5 EC only)
Buctril M
MCPA
Stampede EDF

How it Works:

A non-systemic, synthetic pyrethroid which works by contact and ingestion.

Effects of Weather:

Do not spray under a strong temperature inversion, or when temperature exceeds 25°C. Do not apply within 1 hour of rain.

Restrictions:

Grazing: Do not feed treated alfalfa to beef cattle within 90 days of harvest. Do not allow beef cattle to graze treated cereals, flax, lentils, pasture or rangeland within 1 day of application. Dairy cattle must not be fed or grazed on Decis treated crops.

Storage: Do not store below freezing. Do not store near feed, food, seeds or fertilizer. Keep away from heat, sparks and open flames. If stored for 1 year or longer, shake well before using.

Others: Observe a 16 yard (15 m) buffer zone from environmentally sensitive areas (for example, wetlands, sloughs, rivers, houses, farm buildings) when applying by ground equipment and a 110 yard (100 m) buffer zone when applied by air. The number of aerial applications permitted varies with crop. Consult container label. In soils with high organic content (muck soils), Decis 5 EC should be applied only once per season, prior to August 1, and at rates of no more than 80 mL/acre.

Insects Controlled and Registered Crops:

DECIS 5EC

CROPS	INSECT
Alfalfa (seed crops only)	Lygus bug, alfalfa weevil
Field corn	European corn borer
Potatoes	Colorado potato beetle, potato flea beetle, tarnished plant bug, leafhopper
Canola, mustard	Flea beetle, clover cutworm, bertha armyworm, diamondback moth, beet webworm
Sunflowers	Sunflower beetle
Wheat, barley, oats, lentils, flax	Cutworms, grasshoppers

DECIS 5EC cont'd

CROPS	INSECT
Rangeland, pastures, roadside, fence row	Grasshoppers
Flax	Cutworms, beet webworm

DECIS 5F

CROPS	INSECT
Canola	Flea beetle
Wheat, barley, oats, flax, lentils	Grasshoppers
Rangeland, pastures	Grasshoppers

Rates, Costs, Preharvest Intervals:

DECIS 5EC

INSECT	RATE	COST	PREHARVEST INTERVAL
Alfalfa weevil, lygus bug (alfalfa)	0.08 - 0.1 L/acre	$8.77 - $10.97/acre	20 days
Cutworms (see above)	0.08 L/acre	$8.77/acre	30 days (lentils), 31 days (oats) 40 days (flax, wheat, barley)
Grasshoppers (see above)	0.04 - 0.06 L/acre (ground) 0.06 L/acre (air)	$4.39 - $6.58/acre	30 days (lentils), 31 days (oats) 40 days (flax, wheat, barley) 1 day (rangeland pastures, roadsides, fence row)
Bertha armyworm, clover cutworm, diamond-back moth, flea beetles, beet webworm (canola)	0.04 - 0.06 L/acre	$4.39 - $6.58/acre	14 days (Canola, mustard)
Colorado potato beetle, potato flea beetle, tarnished plant bug, leafhoppers (potatoes)	0.04 - 0.06 L/acre	$4.39 - $6.58/acre	3 days
Sunflower beetle (sunflower)	0.04 L/acre	$4.39/acre	70 days
European corn borer (corn)	0.1 - 0.12 L/acre	$10.97 - $13.16/acre	Maximum 3 applications per year
Beet webworm (flax)	0.04 - 0.06 L/acre	$4.39 - $6.58/acre	40 days

DECIS 5F

INSECT	RATE	COST	PREHARVEST INTERVAL
Flea beetle (canola)	0.04 - 0.06 L/acre	$5.17 - $7.76/acre	14 days
Grasshoppers (see above)	0.032 - 0.048 L/acre (ground) 0.048 L/acre (air)	$4.14 - $6.21/acre	1 day (pastures) 30 days (lentils) 31 days (oats) 40 days (wheat, barley, flax)

Precautions:

Decis is of high mammalian toxicity and a severe eye and skin irritant. Avoid contacting or breathing spray mist. Very toxic to aquatic organisms and fish. Toxic to bees. Avoid spraying when bees are foraging.

Wear protective clothing, including goggles and respirator, when handling or spraying. Do not contaminate or store near feed or foodstuffs. Wash thoroughly after using Decis.

Hazard Rating:

Danger Poison

Diazinon

Company:

United Agri Products

Formulations:

Diazinon 500E – 50% diazinon formulated as a liquid. Container size: 4 L, 10L

Diazinon 50W – 50 % diazinon formulated as a wettable powder. Container size: 2 kg

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	Aphids, flea beetles, Colorado potato beetles, leafhoppers
Corn, peas, beans	Seedcorn maggot
Beans (field and lima)	Aphids, leafhoppers, mites
Rangeland, pasture, ditch banks, roadsides, fence rows, wasteland.	Grasshoppers

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids (potatoes), flea beetles, Colorado potato beetle, leafhoppers (potatoes)	0.445 L/ acre (Diazinon 500E) 0.445 kg/ acre (Diazinon 50W)	$6.45 / acre $7.90 / acre	14 14
Seedcorn maggot	20g / 300 ml water / 4 L seed (Diazinon 50W)	N/A	N/A
Aphids (beans), mites, leafhoppers (beans)	0.445 L / acre (Diazinon 500E)	$6.45 / acre	3
Grasshoppers	0.445 L / acre (Diazinon 500 E) 0.445 kg / acre (Diazinon 50W)	$6.45 / acre $7.90 / acre	Do not spray livestock directly. Dairy and beef cattle and sheep may be grazed or fed green forage immediately following application. Hay may be fed if not cut for 21 days following application.

Application:

Apply Diazinon 50W by ground only.

How it Works:

Diazinon is an organophosphate insecticide with systemic and contact activity.

Effects of Weather:

Diazinon 500E and 50W work most effectively if the temperature is 20°C or more or when temperatures will reach or exceed this minimum.

Restrictions:

Beneficial insects: Avoid spraying open flowers. Highly toxic to bees exposed to direct treatment or to residues on crops.

Environment: Do not contaminate any body of water, waterway or water source. Toxic to birds, fish, and wildlife, including waterfowl.

Precautions:

May be fatal if swallowed. Avoid contact with skin and inhalation of spray mist. Wear an approved respirator. Wash thoroughly after handling and before eating, drinking and smoking.

Hazard Rating:

Caution Poison

Dipel

Company:

Abbott Laboratories

Formulation:

16 BIU/kg of Bacillus thuringiensis ssp. Kurstaki

Insects Controlled and Registered Crops:

CROP	INSECT
Sunflower	Sunflower moth
Timothy	Essex (European) skipper

Rates and Costs:

INSECT	RATE	COST
Sunflower moth	250 - 500 g/acre in 20 L of water (aerially applied)	$10.94 - $21.88/acre
Essex (European) skipper	110 - 120 g/acre	$4.81 - $5.25/acre

Application:

For sunflowers, apply when 20 - 50% heads are in bloom. A spreader sticker such as Triton B1956 should be used to give thorough foliage coverage.

How it works:

A biological stomach insecticide resulting in the larvae ceasing to eat in a few hours, with death usually occurring within 1-3 days.

Restrictions:

Storage: Store at temperatures between 0° and 25°C (cooler temperatures preferable).

Others: Do not allow dilute spray to stand in tank for more than 12 hours. Use product within 24 months of date of manufacture if stored at cool temperatures. Final spray solution for Bt should have a pH of 5 - 7.

Precautions:

May cause dermal sensitization; if irritation persists get medical attention. For contact with skin or eyes, flush eyes or skin with plenty of water.

Hazard Rating:

Caution Poison

Di-Syston

Company:

Bayer Inc.

Formulations:

15 percent disulfoton formulated as a granular. Container size - 20 kg bag.

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	Aphids, Colorado potato beetle, leafhoppers, potato flea beetle
Wheat (fall)	Hessian fly
Beans, peas	Aphids, leafhoppers
Barley, oats	Aphids, mites

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids, Colorado potato beetle, leafhoppers, potato flea beetle	150-200 g/110 yard (100 m) row (Di-Syston 15 G)	$34.50 - $46.00/acre	90 days
Hessian fly	3.04 kg/acre	$20.55/acre	Apply at planting time in the fall
Aphids, leafhoppers (beans) Aphids, leafhoppers (peas) Aphids, mites (barley, oats)	3.0 - 6.1 kg/acre 3.0 - 7.1 kg/acre 3.04 kg/acre	$20.28 - $41.24/acre $20.28 - $48.00/acre $20.55/acre	60 days 50 days 60 days

Application:

Place granules in the seed furrow or in a band on each side of the seed furrow at planting. Application may also be made as a side dressing, either above or with fertilizer after plants become established. Use higher rates in organic soils.

On row crops when row spacing is extremely narrow, do not place Di-Syston treated areas (band or furrow) closer together than 15 centimetres.

How it works:

Di-Syston is a systemic insecticide that enters the plant through the root system. When placed near the root, Di-Syston is picked up and moves in the sap stream to all parts of the plant where it kills insects as they feed on the plant.

Restrictions:

Storage: Store away from food or feed.

Precautions:

Di-Syston is of high acute mammalian toxicity and poisonous if swallowed, inhaled or absorbed through skin. Rapidly absorbed through skin. Wear protective clothing, rubber gloves and goggles. Wear an approved respirator. Do not get in eyes or on skin. Do not breathe fumes or spray mist. Keep all unprotected persons out of the treatment area.

Hazard Rating:

Danger Poison

Dylox

Company:

Bayer Inc.

Formulations:

420 g/L trichlorfon formulated as a liquid.
Container size - 10 L container.

Insects Controlled and Registered Crops:

CROP	INSECT
Alfalfa	Alfalfa caterpillar, alfalfa webworm, beet armyworm, variegated cutworm, lygus bugs, stink bugs, tarnished plant bugs.
Barley, flax, oats, wheat	Armyworm (true), western yellow-striped armyworm, beet webworm, variegated cutworm, bertha armyworm
Beans (dry, Lima, and snap)	Armyworms, imported cabbageworm, dipterous leaf miners, lygus bugs, Mexican bean beetles, stink bug, variegated cutworm
Corn (field, sweet)	Armyworms, cutworms
Canola	Beet webworm, diamondback moth, lygus bug

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Alfalfa caterpillar	0.40 - 0.91 L/acre	$6.57 - $14.95/acre	14 days
Alfalfa webworm	0.28 - 1.11 L/acre	$4.60 - $18.24/acre	14 days
Beet armyworm, variegated cutworm (alfalfa)	0.61 - 1.11 L/acre	$10.02 - $18.24/acre	14 days
Lygus bugs, stink bugs, tarnished plant bug (alfalfa)	1.11 L/acre	$18.24/acre	14 days
Armyworm (true), western yellow-stripped armyworm (barley, flax, oats, wheat)	0.61 L/acre	$10.02/acre	21 days

INSECT	RATE	COST	PREHARVEST INTERVAL
Beet webworm, variegated cutworm (barley, flax, oats, wheat)	0.61 - 1.11 L/acre	$10.02 - $18.24/acre	21 days
Bertha armyworm	1.11 L/acre	$18.24/acre	21 days
Armyworms, cutworms (field and sweet corn)	0.61 - 1.11 L/acre	$10.02 - $18.24/acre	1 day
Armyworms, imported cabbageworm , dipterous leaf miners, lygus bugs, stink bug, variegated cutworm (beans)	1.11 - 1.62 L/acre	$18.24 - $26.62/acre	14 days (snap and dry beans) Do not apply to Lima beans after pod set
Beet webworm (canola)	0.61 L/acre	$10.02/acre	21 days
Diamondback moth (canola)	1.11 L/acre	$18.24/acre	21 days
Lygus bug (canola)	0.55 L/acre	$9.04/acre	21 days

Application:

May be applied by air or ground equipment. Works as a contact or stomach poison. Apply when insects exceed economic threshold levels and use sufficient water for good coverage.

How it Works:

Dylox is an organophosphate insecticide that works as a contact or stomach poison.

Effects of Weather:

Do not apply to alfalfa 48 hours before or after a period when the temperature drops below 5°C or a frost occurs. Under these conditions leaf burn resulting in yield loss may occur.

Restrictions:

Storage: Do not store below 0°C. Keep in cool, dry place. Keep away from heat and open flame.

Others: Do not apply to flax after flowering. Do not contaminate streams, lakes or ponds. May cause spotting of car paint. Wash car immediately if accidental exposure occurs.

Precautions:

Dylox is of high acute mammalian toxicity and can cause eye irritation. Dylox is toxic to bees. May be harmful if swallowed, inhaled or absorbed through the skin. Avoid contact with eyes or skin. Do not breathe vapours. Wash thoroughly with soap and water after handling.

Hazard Rating:

Danger Poison

ECObait

Company:

Peacock Industries

Formulation:

Wheat bran infused with carbaryl insecticide

Container size – 20 kg bag

Insects Controlled and Registered Crops:

CROP	INSECT
Alfalfa, clover, corn (field and sweet), beans, oats, rye, wheat, barley, canola, pastures, rangelands, forage grasses, field borders, headlands, rights-of-way, roadsides, wastelands.	Grasshoppers

Preharvest Intervals and Livestock Re-entry Periods:

CROP	PREHARVEST INTERVAL / LIVESTOCK RE-ENTRY PERIOD
Corn (field and sweet)	1
Alfalfa, clover	2
Beans	5
Oats, rye, wheat	14
Barley	28
Canola	Treat only seedlings
Field borders, headlands, rights-of-way, roadsides, wastelands	0
Entry of beef cattle or other livestock to pastures, rangelands or forage grasses	1
Entry of dairy cattle to pastures or rangelands, harvest of forage crops	2

Rate:

Apply 0.8 – 1.6 kg bait / acre broadcast evenly over the area to be treated. The higher rate should be used for older grasshoppers or severe infestations, or in all instances of thick crop canopy.

Cost:

$2.60 - $5.20/acre.

Application:

For ground application only. Do not apply by air.

Restrictions:

Do not apply within 50 meters of sloughs, ponds, streams, dugouts or open water. Apply when winds are between 3-8 kph and do not favor drift.

Presence of product on flowering crops such as alfalfa and clover will not harm foraging honey or leafcutter bees.

May be used in pastures while beef cattle are grazing.

Precautions:

Harmful if inhaled or swallowed. Avoid breathing dust or vapour from bait. Use only in well ventilated areas. May cause eye irritation. Avoid contact with eyes and skin. Wash thoroughly after handling and before eating or smoking. Avoid contamination of feed and foodstuffs. Keep away from heat, sparks and open flame.

Endosulfan/Thiodan/ Thionex

Company:

Endosulfan - United Agri Products

Thiodan - AgrEvo

Thionex - Makhteshim - Agan of North America Inc. (distributed by United Agri Products)

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulation:

Thiodan/Thionex - 400 g/L endosulfan formulated as an emulsifiable concentrate. Container size - 10 L

Endosulfan - 50% endosulfan formulated as a wettable powder. Container size - 1 kg.

Insects Controlled and Registered Crops:

CROP	INSECT
Potato	Aphid, Colorado potato beetle, flea beetle, leafhopper
Sunflower	Sunflower beetle
Beans	Aphids, potato leafhoppers

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphid, Colorado potato beetle, flea beetle, leafhopper, tarnished plant bug (potatoes)	0.6 - 0.8 L/acre (Thiodan) 0.45 - 0.6l kg/acre (Endosulfan) 0.6 - 0.8 L/acre (Thionex)	$8.37 - $11.16/acre $10.13 - $13.73/acre $8.70 - $11.60/acre	1 day
Sunflower beetle (sunflower)	0.6 L/acre (Thiodan) 0.6 L/acre (Thionex)	$8.37/acre $8.70/acre	60 days
Aphids, potato leafhoppers (beans)	0.6 - 1.0 L/acre (Thiodan) 0.6 - 1.0 L/acre (Thionex)	$8.37 - $13.95/acre $8.70 - $14.50/acre	2 days

Application:

May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage.

How it Works:

Organochlorine insecticides that work as contact and stomach poisons.

Tank Mixes:

Compatible with most commonly used insecticides and fungicides, except Bordeaux mixture and hydrated lime.

Restrictions:

Grazing: Do not feed treated crop residue to livestock.

Storage: Do not store below freezing. If stored one year or longer, shake well before using.

Others: On sunflowers, do not make more than 1 application per season.

Precautions:

Thiodan/Endosulfan/Thionex is of high, acute mammalian toxicity and is toxic to bees. Highly toxic to fish. Hazardous if swallowed, inhaled or absorbed through the skin. Wear synthetic rubber gloves and approved respirator in prolonged spray-mixing and loading operations. Do not apply or allow to drift to areas occupied by unprotected persons and animals or onto streams, lakes or ponds.

Hazard Rating:

Danger Poison

Furadan

Company:

Bayer Inc.

Formulations:

480 g/L carbofuran formulated as a flowable.

Container sizes: Furadan 480F - 4 L jug

How it Works:

Furadan is a broad spectrum, carbamate insecticide, acaricide and nematicide.

Effects of Weather:

Avoid spraying when winds are more than 15 km/hr or less than 5 km/hr. When conditions are hot and dry, set up equipment to produce larger droplets to reduce evaporation effects.

Tank Mixes:

Furadan 480F is compatible with fungicides commonly used on the same crops. Do not mix with Bordeaux and hydrated lime.

Restrictions:

Storage: Do not store below 2°C. Store separately from food and feed.

Aerial restrictions: Do not apply by air on potatoes or sunflowers. Do not spray fields of corn smaller than 12.5 acres (5 ha) by air.

Do not apply Furadan to areas where bees are actively foraging or near apiaries. Do not spray sunflowers after plants are more than 24 inches (60 cm) in height or after heads have started to form. The use of Furadan 480F may be hazardous to burrowing owls. Do not apply within 270 yards (250 m) of known burrowing owl nests. Do not make more than 2 applications per season to potatoes, corn, and sunflower.

Insects Controlled and Registered Crops:

FURADAN 480F

CROP	INSECT
Potatoes	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug
Corn (sweet, field, silage)	European corn borer
Sunflower	Sunflower beetle
Canola, mustard	Flea beetle, red turnip beetle

Application: Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage.

Rates, Costs and Preharvest Intervals:

FURADAN 480F

INSECT	RATE	COST	PREHARVEST INTERVAL
Potato leafhopper, tarnished plant bug	0.445 L/acre	$15.24/acre	7 days
Colorado potato beetle, potato flea beetle	0.222 L/acre	$7.60/acre	7 days
European corn borer	0.445 L/acre	$15.24/acre	7 days
Sunflower beetle	0.11 L/acre	$3.77/acre	60 days
Flea beetle (canola, mustard)	0.06 L/acre	$2.06/acre	Canola - 60 days Mustard - 21 days
Red turnip beetle	0.11 L/acre	$3.77/acre	Canola - 60 days Mustard - 21 days

Precautions:

Of high acute mammalian toxicity. Highly toxic to bees, waterfowl, birds, fish and other wildlife. Poisonous by swallowing or inhalation. Do not breathe spray mist. Do not get in eyes. Wear goggles at all times. Use an approved respirator. Do not re-enter fields less than 48 hours following application, unless appropriate protective clothing is worn. (i.e. long-sleeved shirt and long pants).

Hazard Rating:

Danger Poison

Guthion/Sniper

Company:

Guthion - Bayer Inc.

Sniper - United Agri Products

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulations:

240 g/L azinphos-methyl formulated as a spray concentrate and 50 percent azinphos-methyl formulated as a wettable powder.

Container sizes -
Sniper 240EC - 2 x 10 L
Guthion SC - 2 x 10 L
Guthion Solupak - 4 x 2 kg
Sniper 50W - 10 x 2 kg

Insects Controlled and Registered Crops:

CROP	INSECT
Alfalfa, clover	Sweet clover weevil, grasshopper, aphids, lygus bug, alfalfa plant bug leafhoppers, spittlebugs
Canola	Flea beetle, diamondback moth, red turnip beetle
Wheat, barley, oats, rye	Grasshopper
Potatoes	Colorado potato beetle, tarnished plant bug, aphids
Sunflowers	Sunflower beetle (adults)

Rates, Costs and Preharvest Intervals:

Guthion SC and Sniper 240-E

INSECT	RATE	COST	PREHARVEST INTERVAL
Sweet clover weevil (alfalfa, clover)	0.91 L/acre	$13.01/acre	21 days
Aphids (alfalfa, clover) Aphids (potato)	0.91 - 1.41 L/acre 1.41 L/acre	$13.01 - $20.16/acre $20.16/acre	21 days 7 days
Lygus bug (alfalfa, clover) alfalfa plant bug, leafhoppers, spittlebugs	0.91 - 1.41 L/acre	$13.01 - $20.16/acre	21 days
Grasshoppers	0.44 - 0.70 L/acre	$6.29 - $10.01/acre	21 days (alfalfa, clover) 30 days (cereals)
Diamondback moth (canola)	0.22 - 0.50 L/acre	$3.15 - $7.15/acre	30 days
Flea beetle (canola)	0.11 - 0.22 L/acre	$1.57 - $3.15/acre	30 days
Colorado potato beetle (potatoes)	0.50 - 0.70 L/acre	$7.15 - $10.01/acre	7 days
Tarnished plant bug (potatoes)	0.91 - 1.41 L/acre	$13.01 - $20.16/acre	7 days
Sunflower beetle (sunflower)	0.44 L/acre	$6.29/acre	prior to head formation
Red turnip beetle	0.22 - 0.34 L/acre	$3.15 - $4.86/acre	30 days

Guthion 50 Solupak WP and Sniper 50W Clean Pak:

INSECT	RATE	COST	PREHARVEST INTERVAL
Sweet clover weevil (alfalfa, clover)	0.44 kg/acre	$10.27 - $10.78/acre	21 days
Lygus bug, alfalfa plant bug, leafhoppers, spittlebugs (alfalfa, clover)	0.44 - 0.70 kg/acre	$10.27 - $17.16/acre	21 days
Diamondback moth (canola)	0.11 - 0.22 kg/acre	$2.57 - $5.39/acre	30 days
Flea beetle (canola)	0.06 - 0.11 kg/acre	$1.40 - $2.70/acre	30 days
Colorado potato beetle (potatoes)	0.22 - 0.34 kg/acre	$5.14 - $8.34/acre	7 days
Tarnished plant bug (potatoes)	0.44 - 0.70 kg/acre	$10.27 - $17.16/acre	7 days
Sunflower beetle (sunflower)	0.22 kg/acre	$5.14/acre	prior to head formation
Red turnip beetle	0.11 - 0.17 L/acre	$2.57 - $4.17/acre	30 days

Prices may vary depending on supplier.

Application:

May be applied by air or ground equipment. Apply when insects exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for severe infestations, dense canopy or for adult insects (grasshoppers). Refer to label for specific mixing instructions.

How it Works:

Is a contact, non-systemic, organophosphate insecticide and acaricide.

Restrictions:

Storage: Store at temperatures above freezing. Keep away from heat and open flame. Keep separate from food or feed.

For sunflower beetle control do not apply more than twice per season. For grasshopper control in cereals do not apply more than once per season. Do not apply to alfalfa or clover more than once per cutting at rates higher than 0.91 L/acre. Do not apply to crops in bloom or allow spray to drift toward beehives. Workers who must enter treated fields within 2 days of application should wear protective clothing.

Precautions:

Guthion/Sniper is of high acute mammalian toxicity and is poisonous if swallowed, inhaled or absorbed through the skin. Do not get in eyes or on skin. Do not breathe fumes or spray mist. Wear an approved agricultural respirator, protective clothing, natural rubber gloves and goggles when mixing or applying. Do not re-enter treated fields without protective equipment within 2 days of application. Wash hands, arms and face thoroughly with soap and warm water after use. Wash all contaminated clothing with soap and hot water before re-use.

Highly toxic to bees. Do not spray crops in bloom. To protect fish and wildlife do not contaminate streams, lakes or ponds.

Hazard Rating:

Danger Poison

Lannate

Company:

DuPont Canada Inc.

Formulations:

90% methomyl formulated as a water soluble powder. Container size - (24 x 225 gram water soluble bags).

Insects Controlled and Registered Crops:

CROP	INSECT
Canola	Alfalfa looper, bertha armyworm, clover cutworm, beet webworm
Flax	Bertha armyworm
Peas	Alfalfa looper, pea aphid
Wheat, oats, barley	True armyworm, thrips
Potatoes	Aphids, leafhoppers, flea beetles

Rates, Costs and Preharvest Intervals:

Lannate L

INSECT	RATE	COST	PREHARVEST INTERVAL
Alfalfa looper, bertha armyworm, clover cutworm, beet webworm (canola)	87.4 - 206.4 g/acre	$5.94 - $14.04/acre	8 days
Alfalfa looper, pea aphid (peas)	206.4 g/acre	$14.04/acre	1 day
True armyworm (cereals)	109.3 - 218.5 g/acre	$7.43 - $14.86/acre	20 days
Aphids, flea beetles, leaf hoppers (potatoes)	218.5 g/acre	$14.86/acre	3 days
Thrips (wheat, oats, barley)	121.4 g/acre	$8.26/acre	20 days
Bertha armyworm (flax)	89.0 - 109.3 g/acre	$6.05 - $7.43/acre	8 days

Application:

May be applied to canola, flax and cereals by air or ground equipment. Ground applications only to peas and potatoes. Apply when insects exceed threshold levels using sufficient water for good coverage.

Use higher rates for mature insects, dense canopy or when infestations are heavy. For specific mixing instructions, refer to product labels.

When applied by air, pilot should not assist in mixing and loading operations.

How it Works:

Lannate is a carbamate insecticide which works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short term residual. Rapid knockdown.

Restrictions:

Storage: Do not store below 0°C. Store in original container away from other pesticides, fertilizer, food or feed.

Others: Sprays or drift must not contact workers, other persons or animals. The area being treated must be vacated by unprotected persons.

Precautions:

Lannate is of high acute mammalian toxicity. May be fatal or cause blindness if swallowed. Poisonous if inhaled. Do not breathe vapours or spray mist. Do not get in eyes, on skin or on clothing.

Toxic to fish, birds and other wildlife. Keep out of any body of water. Do not apply where run-off is likely to occur. Do not allow to drift from treated areas. Highly toxic to bees exposed to direct application. Do not apply to areas being visited by bees. Time applications to coincide with minimum bee activity.

When mixing, loading or applying Lannate, wear protective clothing, goggles and an approved respirator. Wear clean clothes daily. Wash thoroughly after handling or applying.

First Aid:

If swallowed, drink 1 to 2 glasses of water and induce vomiting. Get medical attention immediately. If inhaled, remove from exposure. If patient is not breathing, begin artificial respiration immediately. In case of contact, wash skin with plenty of soap and water. If in eyes, flush with water for 15 minutes. Remove and wash contaminated clothing before re-use. Atropine sulphate is an antidote.

Hazard Rating:

Danger Poison

Lindane

Companies and Products*:

Gustafson: Vitavax Dual Powder, Vitaflo Dual Purpose, Vitavax Dual Solution, Vitavax RS Flowable, Vitavax RS Dynaseal, Cloak

United Agri Products: DB Green L Dual Purpose

IPCO: NM Dual Purpose

Norac Concepts Inc.: Agrox B-3, Agrox D-L Plus

Rhone-Poulenc Canada Inc.: Foundation

Zeneca: Premiere Plus

*See Plant Disease Control section of this guide for descriptions of individual products.

How it Works:

Lindane is an organochlorine insecticide and acts as a neurotoxicant.

Insects Controlled and Registered Crops for Seed Treatments Containing Lindane:

CROP	INSECT	PESTICIDE
Canola, mustard	Flea beetles	Premiere Plus, Vitavax RS Flowable, Vitavax RS Dynaseal, Cloak, Foundation, Sapphire
Wheat, Barley, Oats, Rye	Wireworms	Vitavax Dual Powder, Vitavax Dual Solution, Vitaflo Dual Purpose, DB Green L Dual Purpose, NM Dual Purpose (wheat)
Corn, beans, peas	Wireworms, Seedcorn maggot	Agrox B-3, Agrox D-L Plus

Lorsban/Pyrinex

Company:

Lorsban - Dow AgroSciences

Pyrinex - United Agri Products

Different trade names refer to different companies. Note that products may have different label recommendations. Check your label for more information.

Formulations:

480 g/L chlorpyrifos formulated as an emulsifiable concentrate. Container sizes - 10 L jug, 115 L returnable container, 208 L drum.

Insects Controlled and Registered Crops:

CROP	INSECT
Barley, oats, wheat	Army, dark sided, pale western and redbacked cutworms, armyworms, grasshoppers
Wheat	Russian wheat aphid, brown wheat mite, orange wheat blossom midge
Canola	Dark-sided, redbacked, pale western, and army cutworms, bertha armyworm, alfalfa looper, armyworm, diamondback moth larvae, grasshoppers, lygus bug
Flax	Dark-sided, redbacked, pale western, and army cutworms, armyworm, bertha armyworm
Lentils	Pale western cutworm, grasshoppers
Sunflowers	Redbacked, pale western and army cutworms, sunflower seed weevil
Field and sweet corn	Dark sided, black and redbacked cutworms, seed corn maggot
Potatoes	Colorado potato beetle (larvae), potato flea beetle, tarnished plant bug, redbacked cutworm

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Armyworm, army cutworm, darksided cutworm, pale western cutworm, redbacked cutworm (except potatoes and corn)	0.354 - 0.486 L/acre	$5.53 - $8.57/acre	60 days (barley, wheat, oats) 21 days (canola and flax) 60 days (lentils) 42 (sunflowers)
Grasshoppers (except lentils)	0.235 - 0.354 L / acre	$3.67 - $6.24 / acre	60 days (barley, wheat, oats) 21 days (canola)
Grasshoppers (lentils)*	0.235 - 0.486 L/acre	$4.14 - $8.57/acre	21 - 60 days
Brown wheat mite	0.253 L/acre	$3.95 - $4.46/acre	60 days
Russian wheat aphid	0.202 L/acre	$3.15 - $3.56/acre	60 days
Wheat midge	0.336 - 0.405 L/acre	$5.24 - $7.14/acre	60 days
Alfalfa looper, armyworm (canola)	0.304 - 0.405 L/acre	$4.74 - $7.14/acre	21 days
Diamondback moth larvae, lygus bug*	0.405 L/acre	$7.14/acre	21 days
Bertha armyworm**	0.304 - 0.405 L/acre	$4.74 - $7.14/acre	21 days
Sunflower seed weevil*	0.486 L/acre	$8.57/acre	42 days
Darksided cutworm, black cutworm, redbacked cutworm (potatoes, sweet and field corn)	0.971 L/acre (preplant treatment) 0.486 - 0.971 L/acre (seedling treatment)	$15.61 - $17.12/acre $7.59 - $17.12/acre	Not applicable
Larvae of Colorado potato beetle, potato flea beetle, tarnished plant bug	0.405 L/acre	$6.32 - $7.14/acre	7 days

***Lorsban 4E only** ****Pyrinex 480 EC registered for bertha armyworm control in canola only.**

Prices may vary depending on supplier.

Application:

May be applied by air or ground equipment. Ground application only for redbacked cutworm control in corn and sunflower. Ground application only for potatoes. Uniform coverage of the crop is essential in aerial applications. Apply when insects exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for heavy infestations, mature insects, heavy crop canopy, or under dry soil conditions.

Mixing instructions differ for Lorsban and Pyrinex. For specific mixing instructions refer to product labels.

How it Works:

Lorsban and Pyrinex are broad spectrum, non-systemic insecticides. They work by contact, ingestion and vapour action (inhalation).

Effects of Weather:

Avoid application under hot temperatures. Best results will be obtained when application is made in evening (after 7 p.m.) or morning (before 8 a.m.). Do not apply to plants under extreme drought stress or crop injury may occur.

Tank mixes:

Lorsban 4E may be tank mixed with the following herbicides:

- Avenge 200-C
- Banvel plus 2,4-D amine
- Buctril M
- MCPA ester and amine
- 2,4-D amine and ester

When tank mixing always add the herbicide to the spray tank, then add Lorsban 4E. If Lorsban 4E is added first, settling out may occur causing plugging of lines or nozzles.

Restrictions:

Grazing: Treated cereals grown for cover crop should not be used for human or animal consumption within 60 days of harvest.

Storage: Combustible. Do not store near heat or flame. Do not store with food, feed, drugs or clothing.

Others: Do not use more than 9 applications on potatoes per season.

Do not use more than 5 applications or more than a total of 2.162 L/acre on wheat, barley and oats.

Precautions:

Lorsban 4E and Pyrinex 480 EC have a high acute mammalian toxicity. Very toxic to bees, fish, birds, aquatic organisms and other wildlife. May be fatal if swallowed. Causes substantial but temporary eye injury. Harmful if absorbed through skin. May cause skin or eye irritation. Wear protective clothing, impervious gloves and goggles. Wash thoroughly with soap and water after handling and applying. Immediately remove contaminated clothing and wash before re-use. Do not apply or allow to drift on to workers or other persons.

Do not apply directly to water or where runoff could occur to adjacent aquatic sites. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds.

Hazard Rating:

Danger Poison

Malathion/Fyfanon

Company:

Malathion - United Agri Products, IPCO

Fyfanon - Cheminova

Different companies produce malathion. Note differences in label recommendations. Check your label for more information.

Formulations:

500 g/L malathion formulated as an emulsifiable concentrate.

Application:

May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels using sufficient water for good coverage. Use higher rates for heavy infestations, dense canopy or mature stages of insects.

Insects Controlled and Registered Crops:

CROP	INSECT
Alfalfa, clover	Grasshopper (young), aphid, lygus bug, alfalfa weevil larvae, leafhoppers, alfalfa blotch leafminer
Canola	Flea beetle, diamondback moth, grasshopper (young)
Wheat, barley, oats, rye	Grasshopper (young), aphid, true armyworm
Potatoes	Colorado potato beetle, leafhopper, aphid
Canaryseed, peas, beans	Aphid
Sweet clover	Sweet clover weevil
Flax, lentils, hay, pasture	Grasshopper (young)
Corn (grain, forage)	Earworms, European corn borers

Rates, Costs and Preharvest Intervals:

Malathion 500 (IPCO)

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids (beans)	0.56 - 1.21 L/acre	$4.14 - $8.95/acre	1 day
Aphids (cereals)	0.60 - 0.80 L/acre	$4.44 - $5.92/acre	7 days
Aphids (alfalfa)	0.80 - 1.21 L/acre	$5.92 - $8.95/acre	7 days
Aphids (potato)	0.56 - 0.80 L/acre	$4.14 - $5.92/acre	3 days
Leafhoppers, Colorado potato beetle	0.56 - 0.80 L/acre	$4.14 - $5.92/acre	3 days
Grasshopper (alfalfa)	0.80 - 1.21 L/acre	$5.92 - $8.95/acre	7 days
Grasshopper (cereals)	0.68 L/acre	$5.03/acre	7 days
Grasshopper (flax, canola)	0.44 - 0.68 L/acre	$3.26 - $5.03/acre	7 days
Grasshopper (lentils)	0.68 L/acre	$5.03/acre	14 days
Diamondback moth (canola)	0.22 - 0.34 L/acre	$1.63 - $2.52/acre	7 days
Flea beetle (canola)	0.44 L/acre	$3.26/acre	7 days
Sweet clover weevil	0.56 - 1.01 L/acre	$4.14 - $7.47/acre	7 days
True armyworm	0.60 - 0.80 L/acre	$4.44 - $5.92/acre	7 days
Lygus bug (alfalfa)	0.80 - 1.21 L/acre	$5.92 - $8.95/acre	7 days

Malathion 500E (United Agri Products), Fyfanon (Cheminova)

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids (alfalfa, clover)	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Aphids (beans)	0.61 - 1.11 L/acre	$7.50 - $13.64/acre	1 day
Pea aphids (peas)	0.91 L/acre	$11.18/acre	3 days
Aphids (potatoes)	0.61 - 0.91 L/acre	$7.50 - $11.18/acre	3 days
Aphids (barley, oats, wheat, rye)	0.45 - 1.11 L/acre	$5.53 - $13.64/acre	7 days
Aphids (canary grass - for seed)	0.56 L/acre	$6.88/acre	14 days
Grasshoppers (alfalfa)	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Grasshoppers (flax)	0.45 - 0.71 L/acre	$5.53 - $8.73/acre	7 days
Grasshoppers (lentils)	0.69 L/acre	$8.48/acre	14 days
Grasshoppers (canola, mustard)	0.45 - 0.71 L/acre	$5.53 - $8.73/acre	7 days
Grasshoppers (wheat, oats, rye, barley)*	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Grasshoppers (pastures)*	0.69 - 1.2 L/acre	$8.48 - $14.75/acre	7 days
Leafhoppers (alfalfa)	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Leafhoppers (beans)	0.61 - 1.11 L/acre	$7.50 - $13.64/acre	1 day
Leafhoppers (peas)	0.91 L/acre	$11.18/acre	3 days
Leafhoppers (potatoes)	0.61 - 0.91 L/acre	$7.50 - $11.18/acre	3 days
Alfalfa weevil larvae, lygus bugs (alfalfa)	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Alfalfa blotch leafminer	1.11 L/acre	$13.64/acre	7 days
Earworms, European corn borers (corn)	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	5 days
Armyworms (barley, oats, wheat, rye)	0.45 - 1.11 L/acre	$5.53 - $13.64/acre	7 days
Flea beetles (canola, mustard)	0.45 - 0.71 L/acre	$5.53 - $8.73/acre	7 days
Diamondback moth larvae (canola, mustard)	0.22 - 0.34 L/acre	$2.70 - $4.18/acre	7 days
Colorado potato beetle (potatoes)	0.61 - 0.91 L/acre	$7.50 - $11.18/acre	3 days
Spittlebugs (alfalfa, clover)*	0.91 - 1.11 L/acre	$11.18 - $13.64/acre	7 days
Sweet clover weevils (sweet clover)	0.61 - 1.01 L/acre	$7.50 - $12.41/acre	Cattle may be returned immediately after spraying.

*Malathion 500E only.

How it Works:

Malathion is a non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic.

Effects of Weather:

Apply only when daytime temperatures are above 20°C.

Restrictions:

Grazing: When spraying forages and pastures, cattle should be removed and returned after spraying.

Storage: Do not store near food or feed. Store in a cool dry place but not below -10°C. Protect from heat.

Others: Do not apply to any plant in bloom. Apply to crops when bees are absent from field. Avoid contact with automobile paint and wash immediately if exposure occurs.

Precautions:

Malathion has a low acute mammalian toxicity. Highly toxic to bees and fish. Wear protective clothing to reduce skin and eye exposure.

Hazard Rating:

Caution Poison - UAP Malathion, Fyfanon

Warning Poison - IPCO Malathion

Matador

Company:

Zeneca Agro

Formulations:

120g/L cyhalothrin-lambda.

Container size - 3.78 L (4 x 3.78 L).

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug, tuber flea beetle, Lygus bug
Canola, mustard	Crucifer flea beetle, grasshoppers, Lygus bug
Sunflower	Sunflower beetle
Wheat, barley, oats	Grasshoppers
Unimproved pasture, summerfallow, alfalfa	Grasshoppers
Flax	Grasshoppers
Alfalfa	Alfalfa weevil, Lygus bugs, pea aphid, potato leafhopper
Corn	European corn borer, corn earworm, fall armyworm, cutworms

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug, tuber flea beetle	0.034 L/acre	$4.15/acre	7 days
Crucifer flea beetle, Lygus	0.034 L/acre	$4.15/acre	50 days
Sunflower beetle	0.017 - 0.026 L/acre	$2.08 - $3.18/acre	70 days
Grasshoppers*	0.026 - 0.034 L/acre	$3.18 - $4.15/acre	Canola, mustard - 50 days Cereals - 28 days Flax - 50 days
Alfalfa weevil, Lygus bugs (alfalfa), pea aphid, potato leafhopper (alfalfa)	0.034 L / acre	$4.15 / acre	Do not apply within 14 days of livestock foraging.
European corn borer, corn earworm, fall armyworm, cutworms	0.034 L / acre	$4.15 / acre	1 day (sweet corn) 14 days

*** Do not graze cereals or unimproved pasture for 14 days after treatment.**

Application:

Apply by ground only.

Timing:

For potato insects, timing of application should be based on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring.

For sunflower beetles, use the high rate to control adults.

For flea beetles, to prevent migration of overwintering adults throughout the field, spray a 15 m strip around the field at the first sign of flea beetle feeding.

For grasshoppers, apply the low rate when grasshoppers are up to the 3rd nymphal stage (up to 1 cm in length) or when insect numbers are low. Apply the high rate when insects are larger, up to but not including, winged adults or when insect numbers are high.

How it Works:

A synthetic pyrethroid insecticide. It is a fast acting stomach and contact insecticide effective against a broad spectrum of foliar pests. It has no fumigant or systemic activity.

Effects of Weather:

For best results, apply Matador 120 EC during the early morning before temperatures rise, and during the evening, past the heat of the day.

Restrictions:

Grazing: Do not graze or feed lactating dairy animals on treated green cereal forage or treated pasture.

Storage: Store above 0°C. Storage below 0°C will not impair the effectiveness of Matador 120 EC, however, following such storage, agitate well before use.

Others: Do not apply by air. Do not use more than 3 applications per year. Allow a 7-day interval between applications. Do not apply within 15 m of productive fisheries water, or waterfowl habitat.

Precautions:

Matador has potential for skin and eye irritation. Avoid splashing in eyes or on skin, particularly the face. If hands are contaminated, wash with soap and water before touching other areas of skin. This product is very toxic to bees. Avoid spraying when bees are foraging. Spray deposits should be dry before bees commence foraging in treated crops.

Hazard Rating:

Danger Poison

Monitor

Company:

Bayer Inc., United Agri Products

Formulations:

480 g / L methamidophos formulated as a liquid. Container size - 10 L pail.

Insects Controlled and Registered Crops:

CROP	INSECT
Canola	Bertha armyworm, grasshoppers
Potatoes	Colorado potato beetle, potato flea beetle, potato leafhopper, aphids

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Bertha armyworm	0.23 - 0.5 L / acre	$6.56 - $14.25 / acre	10 days
Grasshoppers	0.5 L / acre	$14.25 / acre	10 days
Colorado potato beetle, potato flea beetle, potato leafhopper, aphids (potatoes)	0.71 - 0.91 L / acre	$20.24 - $25.94 / acre	14 days

Application:

May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels using sufficient water for good coverage. Use higher rates for mature stages of insects, dense canopy or heavy infestations.

How it Works:

A broad spectrum organophosphorous insecticide and acaricide which works by contact and systemic action. Contact effectiveness may persist for 7 to 21 days.

Restrictions:

Storage: Store in a cool, dry place but not below -10°C. Do not store near food or feed. Protect from heat.

Others: Only 2 applications per season may be made on canola for bertha armyworm and grasshoppers. Highly toxic to bees exposed to direct treatment or residues on crops. Avoid use during flowering and pollination periods. Do not contaminate any bodies of water.

Precautions:

Monitor is of high acute mammalian toxicity and is extremely toxic to fish, wildlife and bees. Poisonous if swallowed, inhaled or absorbed through skin. Rapidly absorbed through skin. Wear an approved respirator, natural rubber gloves, protective clothing and goggles. Wash hands, arms and face with soap and water after handling and applying. Wash all contaminated clothing with soap and hot water before re-use. Keep unprotected persons out of operating or spray areas or where drift could occur.

Do not re-enter treated areas until drifting insecticide and volatile residues have dissipated. Do not store or transport with feed or food.

Hazard Rating:

Danger Poison

Orthene

Company:

Distributed by United Agri Products

Formulation:

75 percent acephate as a water soluble powder. Container size – case of 12 x 1.5 kg

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	green peach aphid, potato aphid, potato flea beetle, potato leafhopper, tarnished plant bug

Rates, Cost and Preharvest Intervals:

Insect

Green peach aphid, potato aphid, potato flea beetle, potato leafhopper, tarnished plant bug

Rates:

0.300 kg (in 90 litres water) – 0.44 kg (in 660 litres of water)/ acre

Cost:

$15.35 - $22.51 / acre

Preharvest Interval

Do not apply within 21 days of harvest.

Application:

Apply with conventional ground equipment only. Do not apply by air.

Apply only when insects exceed economic thresholds.

Use higher rate only for heavy infestations.

How it Works:

Acephate is an organophosphate systemic insecticide that works through contact and as a stomach poison.

Effects of Weather:

Do not apply if rainfall is expected within 48 hours after application. Treatment areas should not be irrigated for at least 48 hours after application.

Restrictions:

Storage: Store in cool, dry place, in the original container away from food or feed. Protect from excessive heat.

Environment: Orthene has the potential to leach through soils to ground water. It is recommended that Orthene is not used on coarse textured soils or in areas where the water table may be high.

Do not feed foliage to livestock or allow animals to graze on treated areas.

Do not make more than 4 applications per season.

Others: Orthene is not registered in the United States. Therefore Orthene should not be used on any produce destined for markets in the United States.

Precautions:

Orthene is toxic to birds and mammals.

Orthene is toxic to aquatic invertebrates. Do not apply where runoff or drift is likely to occur.

Orthene is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are foraging in the treatment area. Beekeepers should be warned to protect bees from treated areas for one week after treatment.

First Aid:

If swallowed, induce vomiting and obtain medical attention or call a poison control centre immediately. In case of contact with skin, wash with soap and water. If in eyes, flush with water. See a physician if eye irritation persists. Atropine is an antidote.

Hazard Rating:

Orthene 75%:

Caution Poison

Pirimor

Company:

Zeneca

Formulation:

50 percent pirimicarb formulated as a dry flowable. Container sizes - 10 x 1 kg bags.

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	Green peach aphid, potato aphid, buckthorn aphid
Peas	Pea aphid
Sweet corn	Aphids

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Green peach aphid, potato aphid, buckthorn aphid (potatoes)	0.170 - 0.220 kg/acre	$15.09 - $19.57/acre	7 days
Pea aphid	0.06 - 0.110 kg/acre	$5.32 - $9.76/acre	6 days
Aphids (sweet corn)	0.220 kg/acre	$19.52/acre	3 days

Application:

May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage. Use higher rates when insect populations are high or when very cool weather is prevailing.

How it Works:

A fast-acting aphicide that works by contact, vapour and local systemic action.

Restrictions:

Storage: Store in original container in a dry place. Highly flammable.

Others: Do not contaminate any bodies of water.

Precautions:

Pirimor is of high acute mammalian toxicity. Avoid breathing dust or spray mist. Avoid contact with skin and eyes. Harmful to livestock. Avoid contamination of food or feed, ponds, lakes and waterways. Wear suitable gloves, protective clothing and an eye protector.

Hazard Rating:

Danger Poison

Ripcord

Company:

Cyanamid Crop Protection

Formulation:

400 g/L cypermethrin formulated as an emulsifiable concentrate.

Container size - 1 L.

Insects Controlled and Registered Crops:

CROP	INSECT
Wheat, barley	Grasshopper, redbacked cutworm
Canola	Grasshopper, flea beetle, bertha armyworm
Roadsides, headlands, summerfallow	Grasshopper
Sunflower	Sunflower beetle, sunflower seed weevil
Corn	European corn borer, redbacked cutworm
Potatoes	Colorado potato beetle, flea beetle, leafhopper, tarnished plant bug, redbacked cutworm

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Grasshopper (up to fourth instar, prior to wing development)	0.02 - 0.028 L/acre	$2.32 - $3.24/acre	Barley - 60 days Wheat - 30 days Canola - 30 days
Redbacked cutworm	0.07 L/acre	$8.11/acre	21 days
Flea beetle	0.02 L/acre	$2.32/acre	30 days
Bertha armyworm	0.028 L/acre (ground) 0.035 L/acre (air)	$3.24/acre $4.05/acre	30 days
Sunflower beetle	0.028 L/acre	$3.24/acre	70 days
Sunflower seed weevil	0.028 L/acre	$3.24/acre	70 days
European corn borer	0.07 L/acre	$8.11/acre	5 days
Colorado potato beetle, flea beetle, leafhopper,	0.025 - 0.05 L/acre	$2.90 - $5.79/acre	7 days
Tarnished plant bug	0.05 L/acre	$5.79/acre	7 days

Application:

May be applied by air or ground equipment. See "Restrictions" (below) for crops and insects. Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage. Use higher rates for mature insect stages (grasshoppers) or severe infestations.

How it Works:

A pyrethroid insecticide that works as a contact and stomach poison.

Effects of Weather:

Activity of Ripcord on grasshoppers is reduced as soil temperature increases. Application for grasshopper control should be made at temperatures below 25°C. Spraying for grasshoppers should be delayed until evening if daytime temperatures are above 25°C.

Restrictions:

Grazing: Treated crops must not be grazed or cut for hay.

Storage: Store in heated storage area. Do not contaminate or store near foodstuffs.

Others: Ripcord may be applied by ground application only, for control of grasshoppers on wheat, barley, roadsides, headlands and canola; for flea beetle control on canola; and for control of redbacked cutworm. Ripcord may be applied by ground or air for bertha armyworm, sunflower beetle, sunflower seed weevil, European corn borer and Colorado potato beetle, flea beetle, leafhoppers and tarnished plant bug on potatoes. Only 1 aerial application is permitted per season for bertha armyworm on canola and sunflower beetle and seed weevil on sunflower, and 2 applications per season for corn and potatoes.

Observe a 16 yard (15 m) setback from water bodies and other sensitive areas when applying Ripcord with ground application. Observe a 110 yard (100 m) setback from water bodies and sensitive areas when applying by air.

Precautions:

Ripcord is of low to moderate acute mammalian toxicity and very toxic to bees, fish, and aquatic organisms. Harmful or fatal if swallowed. May be harmful if absorbed through skin.

Severely irritating to eyes. Causes skin irritation and sensitization. Wear long-sleeved protective clothing and gloves when handling or applying. Wear face shield or goggles when mixing. Do not apply where streams, lakes and ponds may be contaminated. Avoid spraying when bees are foraging.

Hazard Rating:

Caution Poison

Sevin XLR Plus

Company:

Rhone-Poulenc Canada Inc.

Formulation:

480 g/L carbaryl formulated as a liquid suspension (Sevin XLR Plus).

Container size - Sevin XLR Plus - 10 L jug.

Insects Controlled and Registered Crops:

CROP	INSECT
Canola	Flea beetle
Alfalfa, clover	Grasshopper, blister beetle
Barley, oats, rye, wheat	True armyworm, grasshopper
Ditchbanks, field borders, forage grasses, headlands, pastures, rangelands, rights-of-way, wastelands	Grasshopper
Corn (field and sweet)	European corn borer, corn earworm, grasshopper
Potatoes	Colorado potato beetle, flea beetle, leafhopper
Beans	Leafhoppers, lygus bugs

Rates, Costs and Preharvest Intervals:

Sevin XLR Plus

INSECT	RATE	COST	PREHARVEST INTERVAL
Flea beetle (canola)	0.2 L/acre	$2.59/acre	seedling application only
Grasshopper (non-crop, pasture, rangeland)	0.48 - 1.41 L/acre	$6.22 - $18.26/acre	0 days (non-crop) 1 day (pasture, rangeland)
Grasshopper (alfalfa, clover, cereals, corn)	0.50 - 1.01 L/acre	$6.48 - $13.08/acre	2 days (alfalfa, clover) 14 days (wheat, oat, rye) 28 days (barley) 1 day (corn)
Blister beetle (alfalfa, clover)	1.01 - 1.6 L/acre	$13.08 - $20.72/acre	2 days
True armyworm (see above)	1.01 - 2.10 L/acre	$13.08 - $27.20/acre	14 days (wheat, oat, rye) 28 days (barley)
European corn borer, corn earworm (corn)	1.01 - 1.61 L/acre	$13.08 - $20.85/acre	1 day
Colorado potato beetle, flea beetle, leafhopper (potatoes)	0.50 L/acre	$6.48/acre	7 days
Leafhoppers (beans)	1.01 L/acre	$13.08/acre	5 days
Lygus bugs (beans)	2.12 - 2.59 L/acre	$27.45 - $33.54/acre	5 days

Application:

May be applied by air or ground equipment. Apply when insect numbers exceed economic threshold levels and use sufficient water for good coverage. Use lower rates on young plants and early stages of insects and higher rates on mature plants and advanced stages of insects, or mature insects.

Dilutions of 1 volume of XLR Plus with 1 volume of water will allow maximum resistance to wash off by rainfall. Application to dry foliage will ensure greater wash off resistance.

How it Works:

A carbamate insecticide that works by contact and ingestion. Moderate to rapid in speed of action with short to moderate residual activity (2 to 4 weeks).

Effects of Weather:

To avoid possible injury to tender foliage, do not apply to wet foliage or if rain or high humidity is expected during the next two days.

Restrictions:

Storage: Do not store in areas where temperatures frequently exceed 38°C. Store in original container in a cool dry area out of reach of children and animals and away from food and feed.

Others: Remove cattle from area when spraying.

Precautions:

Sevin is of moderate acute mammalian toxicity. This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Harmful if inhaled or swallowed. Avoid contact with skin and eyes. Wear long sleeve work clothing and change to clean clothing daily. Wash hands and face after handling. Avoid contamination of food, feed, water supplies, streams and ponds.

Hazard Rating:

Warning Poison

Thimet

Company:

Cyanamid Crop Protection

Formulations:

15 percent phorate formulated as a granular. Container size - 20 kg bag.

Insects Controlled and Registered Crops:

CROP	INSECT
Potatoes	Aphids, leafhoppers, reduction of potato flea beetle, wireworm, and early season control of Colorado potato beetle

Rates, Costs and Preharvest Intervals:

INSECT	RATE	COST	PREHARVEST INTERVAL
Aphids, leafhoppers, reduction of potato flea beetle, wireworm and early season control of Colorado potato beetle	140 - 215 g/110 yard (100 m) row	N/A	At planting application only (90 days).

Application:

Ground application at seeding time: Distribute granules evenly in furrow or granules may be banded on each side of the row at planting time. Use low rate for sandy or light soils and high rate for silt or heavy soils. Works as a systemic poison with effective initial residual activity on soil and foliar insects.

How it Works:

An organophosphate insecticide that works as a systemic poison, with effective initial residual activity on soil and foliar insects.

Restrictions:

Storage: Do not store in or around the home. Store away from food or feed. Store open bags in labelled sealed drums or heavy plastic bags.

Others: Do not use in muck soils. Do not apply later than at planting time. Will provide reduction of potato flea beetle and wireworm damage and early season potato beetle control.

Precautions:

Thimet is of high acute mammalian toxicity and is highly toxic to fish, birds and other animals. Do not allow product to contact eyes and skin. Poisonous by skin contact, inhalation or swallowing. Repeated inhalation or skin contact with Thimet 15G, other organophosphorus or carbamate insecticides may, without symptoms, progressively increase susceptibility to poisoning. Wear freshly-laundered, long-sleeved work clothing daily. Use rubber gloves when transferring from package to equipment. Sleeve cuffs should be worn over gloves to prevent granules from falling into the gloves. Rubber gloves should be washed with soap and water after each use. Destroy and replace gloves frequently. In case of contact, immediately remove contaminated clothing and wash skin thoroughly with soap and water. While emptying bags into equipment, pour downwind and allow as little free fall as possible. The use of a dust mask is recommended.

Hazard Rating:

Danger Poison

Insect Control in Stored Grain

Prevention

The first step towards keeping stored grain free of insects is prevention. Storage and transport facilities should be cleaned thoroughly and sprayed or dusted, if needed, with a recommended insecticide before storing grain in the bin (e.g. malathion as a 1% solution or Protect-It diatomaceous earth at 5g / m² - refer to label for details). Clean storage will eliminate one source of infestation. However, grain stored for long periods of time still has the potential for renewed infestations. Ideally, the grain should be dry before being put into storage, and cooled as quickly as possible. Aeration systems used during the night immediately after harvest should have the grain below 20°C in 2 weeks. Grain insects cannot multiply at these temperatures. Cooling the grain, through aeration, or moving the grain several times during mid-winter should provide effective control of rusty grain beetles. Moving the grain using pneumatic conveyors (grain vacs) has also been shown to be an effective means of controlling free-living insects in stored grain.

Identification of the pests

Regular monitoring of the stored grain is the next step in determining the presence and potential for serious infestations. Either the presence of insects or damaged kernels will give an indication of a problem. Probably the most sensitive means of detecting insects in stored grain is through the use of probe traps, available from Hedley Technologies Inc. Often the first indication of an infestation will be found near the top centre of a storage bin. As with other insect pests, correct identification of insects present can be important in determining the problem and possible solutions. There are several insects that can be found in stored grains in Manitoba and Saskatchewan. Some of these insects feed on the grains, while others feed on fungus that may be developing in the stored grain.

Grain feeders: Insects that feed on the grain include rusty grain beetles, red flour beetles, and saw-toothed grain beetles. The **rusty grain beetle** is the most common stored product insect. The adult is a flat, rectangular, reddish brown beetle, 2 mm long, with long threadlike antennae. Heavy infestations of this insect cause grain to heat and spoil. The **red flour beetle** is the another common insect pest of stored grain in the prairies. Adults are reddish-brown and 4 mm long. Red flour beetles cannot feed on undamaged, dry seed with less than 12% moisture content. They prefer grain dust, broken grain and milled stocks. Adult **saw-toothed grain beetles** are brown, about 3 mm long, and have six teeth-like projections on each side of the thorax. Saw-toothed grain beetles are more common in stored oats than in stored wheat and barley.

Fungus feeders: Insects that feed on fungus in the grain bin include the foreign grain beetle, psocids, and grain mites. Adult **foreign grain beetles** are brown, and about 2 mm long. They resemble the rusty grain beetle, but can be distinguished from it by club-shaped antennae. Also, when placed in a glass jar, foreign grain beetles will climb up the sides, while rusty grain beetles cannot. **Grain mites** are whitish, soft bodied, and about 0.2 to 0.5 mm long. They can be hard to see with the naked eye. About eight kinds of mites are common in farm granaries and elevators. **Psocids** are soft bodied insects, about 1 mm long, with long antennae relative to the body size.

Fungus feeding insects and mites cannot survive in dry grain. Chemical control is not necessary for fungus feeding pests in stored grain. Practices that result in the grain drying may be all that is needed to control such pests.

Control Techniques:

The Canada Grain Act states there is zero tolerance for any primary insects (those that feed on whole sound grain) in grain delivered to elevators. Outlined below are some control techniques and when and how these techniques can be best used.

Cold Temperatures. Rusty grain beetles are cold hardy and can survive subzero temperatures. Rusty grain beetles and other stored grain insects can be killed by reducing core grain temperatures as follows:

Grain Temperature	Time Required to Kill Insects
-5°C	6 weeks
-10°C	4 weeks
-15°C	2 weeks

It is important to note that maintaining core grain temperatures below 18°C will stop beetles from reproducing and laying eggs, and below 15°C will limit movement and feeding activities.

Phostoxin and Gastoxin.

Company: Degesch America Inc. (Phostoxin); United Agri Products (Gastoxin)

Formulation: 55 percent Aluminum Phosphide. These fumigants are available as pellets or tablets.

Insects controlled: Rusty grain beetle, red flour beetle, saw-toothed grain beetle, granary weevil, Indian meal moth, and yellow mealworm.

Approved for use on the following stored grains: Barley, corn, dried peas, lentils, oats, rice, rye, soybeans, sunflower seeds, triticale, and wheat.

The following table may be used as a guide to determine the minimum length of exposure period to phostoxin and gastoxin at the indicated temperatures:

Temperature	Exposure Period
Below 5°C (40°F)	Do not fumigate
5°C – 12°C (40°-53°F)	10 days
13°-15°C (54°-59°F)	5 days
16°-20°C (60°-68°F)	4 days
above 20°C (68°F)	3 days

If the grain is less than 5°C then the tablets will not release the gas until the grain temperature warms up. This may result in poor control and accidental exposure to phostoxin or gastoxin at a later date in grain handling facilities. Very dry grain will also slow the release of the gas from the pellets.

Protect-It.

Company: Hedley Technologies Inc.

Formulation: 90 percent Diatomaceous Earth (DE) and 10 percent Amorphous Silica

Insects controlled: Rusty grain beetle, rice weevil, granary weevil, Angoumois grain moth, Mediterranean flour moth, Indian meal moth, red flour beetle, and Tribolium.

Approved for use on the following stored products: Feed grains, seed, stored grains, wheat, barley, buckwheat, corn, oats, rye, flax, peas, soybeans, and sorghum. Also registered for structural treatment of empty grain storage and transportation containers.

Protect-It must be applied to grain as it is being loaded into the bin. Protect-It damages the cuticle of the insect, reducing the insect's ability to retain moisture. The insect eventually dies from dehydration The grain must be warm enough for the insects to still be moving for the DE to be effective, and it is most effective when used in dry grain. Tough or damp grain (>16 percent moisture content) will provide insects with a humid environment, which diminishes the desiccating effect of DE. The application rate for Protect-It varies by crop and insect species, ranging from 100 g/tonne for control of rusty grain beetle in wheat to 1000g/tonne for red flour beetle in corn. Refer to the label for details. If desired, Protect-It treated grain can be processed or fed to livestock immediately after treatment.

The application of DE will lower the test weight measurement of the grain, but usually not to the point of downgrading. If test weight loss is excessive the grain can be diluted with untreated grain. DE is non-toxic to humans and animals.

Malathion Grain Protectant Dust.

Company: Interprovincial Co-operative

Formulation: 2 percent malathion

Insects controlled: confused flour beetles, flat grain beetles, granary weevil, Indian meal moth, lesser grain borer, merchant grain beetle, rusty grain beetle and sawtoothed grain beetle.

Approved for use on the following stored grains: Wheat, rye, barley and oats as stored grains.

Malathion Grain Protectant can be applied to grain as it is being loaded into a bin or being turned by adding gradually at the grain auger. It can also be used to control surface infestations by applying to the grain surface and raking in to 15 cm depth of the grain. Malathion controls insects by ingestion and contact and insects must be active for it to be effective. Application rates vary for different crops from 415 g/1,000 kg for wheat to 735 g/1,000kg for oats. See the label for all crop rates. Do not apply to grain within 7 days of sale.

Be aware that the Canadian Grain Commission allows only 8 ppm of malathion residues in stored grains.

Did You Know That . . .

- A Windows-based computer program, called the CROP PROTECTION PLANNER, is available to accompany this publication. The Planner will help you in making quick, accurate decisions about chemical pest control options. It is useful for farmers and people in agribusiness. Access to an IBM-compatible computer is required. For the current pricing or further details on this software, contact the U-Learn Centre at the University of Saskatchewan, telephone (306) 966-5565, FAX (306) 966-5567 or on the Internet at http://www.extension.usask.ca/Publications/
- The PEST CONTROL PRODUCTS (SASKATCHEWAN) ACT and Regulations to that Act require that any person who applies a pesticide for commercial purposes must have a valid applicator's licence. To be eligible for a licence, appropriate training is required from the Agriculture Division of SIAST, telephone 1-800-667-7730 or in Regina (306) 787-4714. Further details regarding licensing requirements can be obtained from the Sustainable Production Branch of Saskatchewan Agriculture and Food - (306) 787-4662.
- The Crop Protection Laboratory offers a range of diagnostic services to assist in the identification of problems associated with all agricultural crops. The major areas of expertise include weed, insect and plant disease identification and herbicide resistance screening. Diagnostic submission forms are available from your Extension Agrologist and Rural Service Centres. Fees for service apply: insect or weed i.d. $10.00; visual plant disease i.d. $20.00; cultured plant disease i.d. $40.00; herbicide resistance screening $30.00 - $60.00. For further information call (306) 787-8130.
- Your local Rural Service Centre is provided with updates to this publication in May of each year. Drop by and ask them what is new or find it on the Internet at http://www.agr.gov.sk.ca.

Weatheradio Canada

Weatheradio is a network of radio stations operated by the weather service of Environment Canada which:

- transmits weather information continuously over VHF-FM radio
- provides up-to-the minute weather forecasts and reports detailed to each broadcast area
- serves the weather information needs of farmers and others
- operates 24 hours each day, seven days a week

Weatheradio is transmitted from 9 locations in Saskatchewan:

- Prince Albert, Stranraer, Regina Beach and Midale on frequency 162.400
- Regina, Swift Current, Yorkton and Saskatoon on frequency 162.550
- North Battleford at 162.475
- Medicine Hat at 162.550 can also be received west of Maple Creek

For more information, contact:
Weather Services Saskatchewan
Atmospheric Environment Service
Environment Canada Telephone: (306) 780-5738 or on the Internet: www.weatheroffice.com

Saskatchewan Pesticide Return Program

This program is an industry led program aimed at the collection and disposal of unwanted and obsolete pesticides. This program will run from 1999 to 2001 and is at no charge to producers. For more information on the Saskatchewan Pesticide Return program, contact your local Rural Service Centre or on the Internet at: www.agr.gov.sk.ca/skpesticidereturn.

Prepared by Saskatchewan Agriculture & Food in co-operation with Manitoba Agriculture and Food and the Weed Sub-Council of the Saskatchewan Advisory Council on Soils and Agronomy.

Crop Protection Companies

Abbott Laboratories
www.abbott.com
1-800-323-9597

AgrEvo
www.ca.agrevo.com
1-800-667-5959

BASF
www.agproducts.basf.com
1-877-371-2273

Bayer
1-877-938-3737

Cheminova
1-888-316-6260

Cyanamid
www.farmlinepartners.com
1-800-387-5073

Degesch America Inc.
1-800-330-2525

Dow Agrosciences
www.dowagro.com/canada/
1-800-667-3852

Dupont
www.dupont.ca/ag/
1-800-667-3925

Engage Agro
(519) 826-7878

Gustafson
www.gustafson.ca
1-800-880-9481

Hedley Technologies
www.hedleytech.com
1-888-476-4473

IPCO
(204) 233-3461

Monsanto
www.farmcentral.com
1-800-667-4944

Norac Concepts
www.noracconcepts.com
(613) 841-2907

Novartis
www.cp.ca.novartis.com
1-800-315-2422

Nufarm
www.amitrol.com
1-800-868-5444

Peacock Industries
(306) 225-4691

Rhone Poulenc
www.rpagriculture.com
1-800-891-8291

Rohm & Haas
www.rohmhaas.com
1-800-205-7766

United Agri Products
www.uap.ca
1-800-561-5444

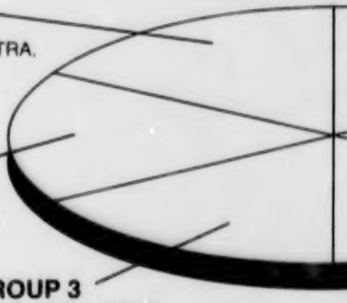
Van Waters & Rogers
www.vwr-ltd.com
1-800-665-8888

Zeneca Agro
www.zeneca.ca
1-800-665-9250

HERBICIDE RO

☐ ROTATING WILD

To delay the onset of resistance, do not use wild oat products fro



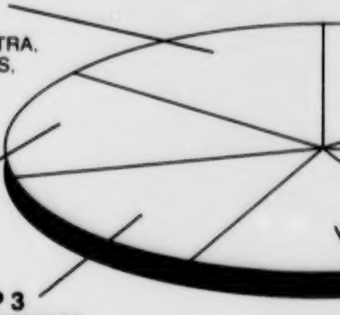
GROUP 1
ACHIEVE, ASSURE II,
CHAMPION EXTRA,
CHAMPION PLUS, FLAXMAX ULTRA,
FUSILADE, FUSION, HARMONY
TOTAL, HORIZON, HOE-GRASS,
POAST ULTRA, PREVAIL,
PUMA SUPER, SELECT,
TRIUMPH PLUS, VENTURE

GROUP 2
ACCENT, ANTHEM, ASSERT,
ODYSSEY, PURSUIT
SUNDANCE

GROUP 3
EDGE, TRIFLURALIN

☐ ROTATING GREEN

To delay the onset of resistance, do not use green foxtail products fro



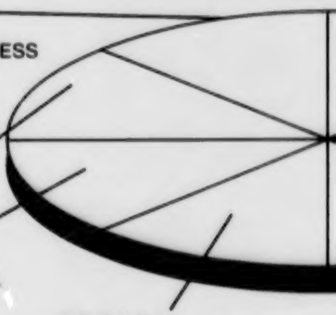
GROUP 1
ACHIEVE, ASSURE II,
CHAMPION EXTRA,
CHAMPION PLUS, FLAXMAX ULTRA,
FUSILADE, FUSION, HOE-GRASS,
HORIZON, LASER DF,
MUSTER GOLD, PLATINUM,
POAST ULTRA, PREVAIL,
PUMA SUPER, SELECT,
TRIUMPH PLUS, VENTURE

GROUP 2
ACCENT,
ODYSSEY,
PURSUIT,
PRISM

GROUP 3
EDGE, FORTRESS,
TRIFLURALIN

☐ ROTATING BROAD

To delay the onset of resistance, do not use broadleaf herbicides fro



GROUP 2
ALLY, ANTHEM, ASSERT
(WILD MUSTARD), CHAMPION
EXTRA, CHAMPION PLUS, EXPRESS
PACK, FREEDOM, HARMONY
TOTAL, LASER DF, MUSTER,
ODYSSEY, PINNACLE, PRISM,
PURSUIT, REFINE EXTRA,
SUNDANCE, TRIUMPH PLUS

GROUP 3
EDGE, TRIFLURALIN

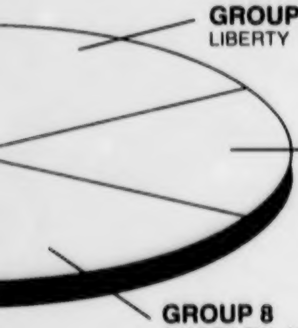
GROUP 4
2,4-D, MCPA, ACCORD, ANTHEM,
ATTAIN, BANVEL II, BREAKER,
CHAMPION PLUS, CURTAIL M,
DYVEL, DYVEL DS, TARGET,
LONTREL, PRESTIGE, ESTAPROP,
TURBOPROP, DICHLORPROP
D & MIXES CONTAINING THESE
ACTIVE INGREDIENTS

GROUP 5
ATRAZINE, BLADEX, LEXONE,
PRIMEXTRA LIGHT, PRINCEP
NINE-T, SENCOR, SIMAZINE

TATION - 2000

OAT HERBICIDES

the same group more frequently than one year in three.



GROUP 10
LIBERTY

GROUP 9
GLYPHOSATE

GROUP 8
AVADEX BW, AVENGE, EPTAM,
ERADICANE, FORTRESS

OXTAIL HERBICIDES

n the same group more frequently than one year in three.

GROUP 10
LIBERTY

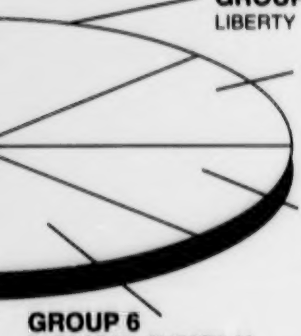
GROUP 9
GLYPHOSATE

GROUP 7
STAMPEDE

ROUP 4
CCORD

LEAF HERBICIDES

n the same group year after year on the same field.



GROUP 10
LIBERTY

GROUP 9
GLYPHOSATE

GROUP 7
AFOLAN F,
LINURON,
LOROX

GROUP 6
BASAGRAN, BUCTRIL M,
HOE-GRASS II, PUMA ONEPASS,
PARDNER, THUMPER